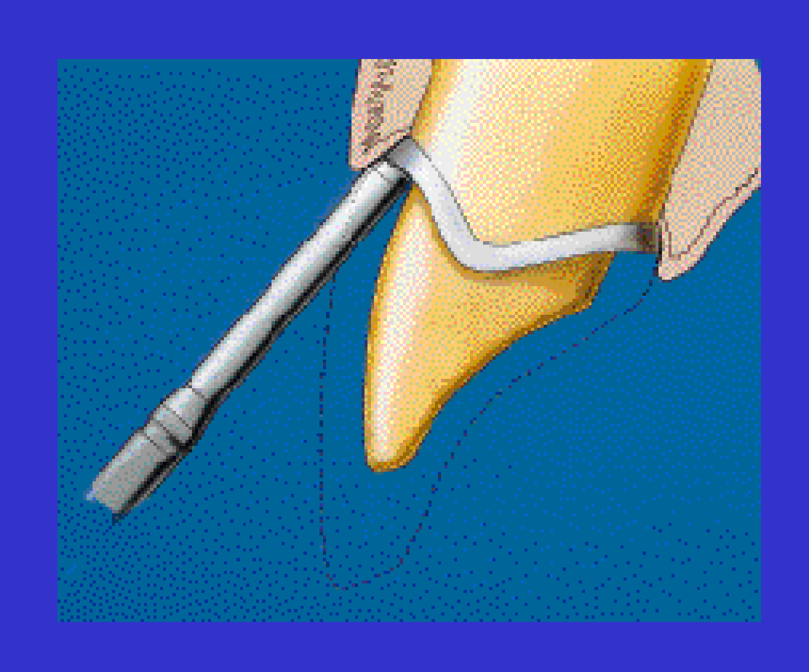
PRINCIPLES OF TOOTH PREPARATION

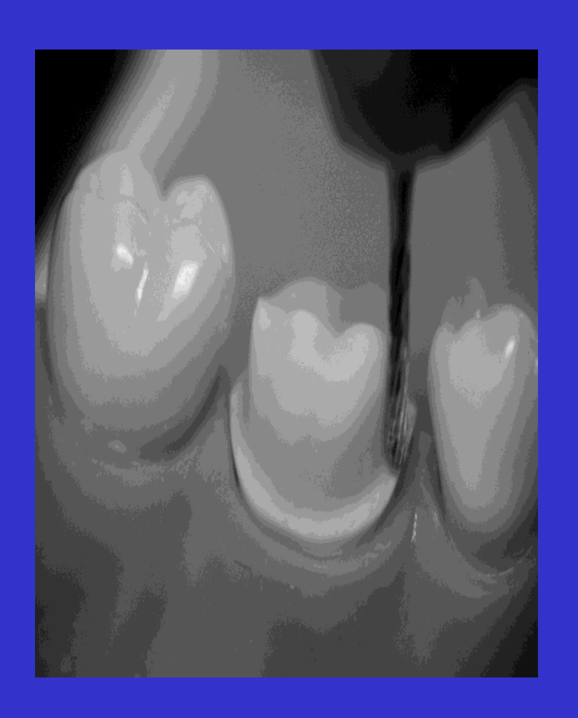




- **Tooth Preparation**

- a clinical procedure consisting of removal of tooth structures and / or shaping of the tooth to accommodate a fixed restoration



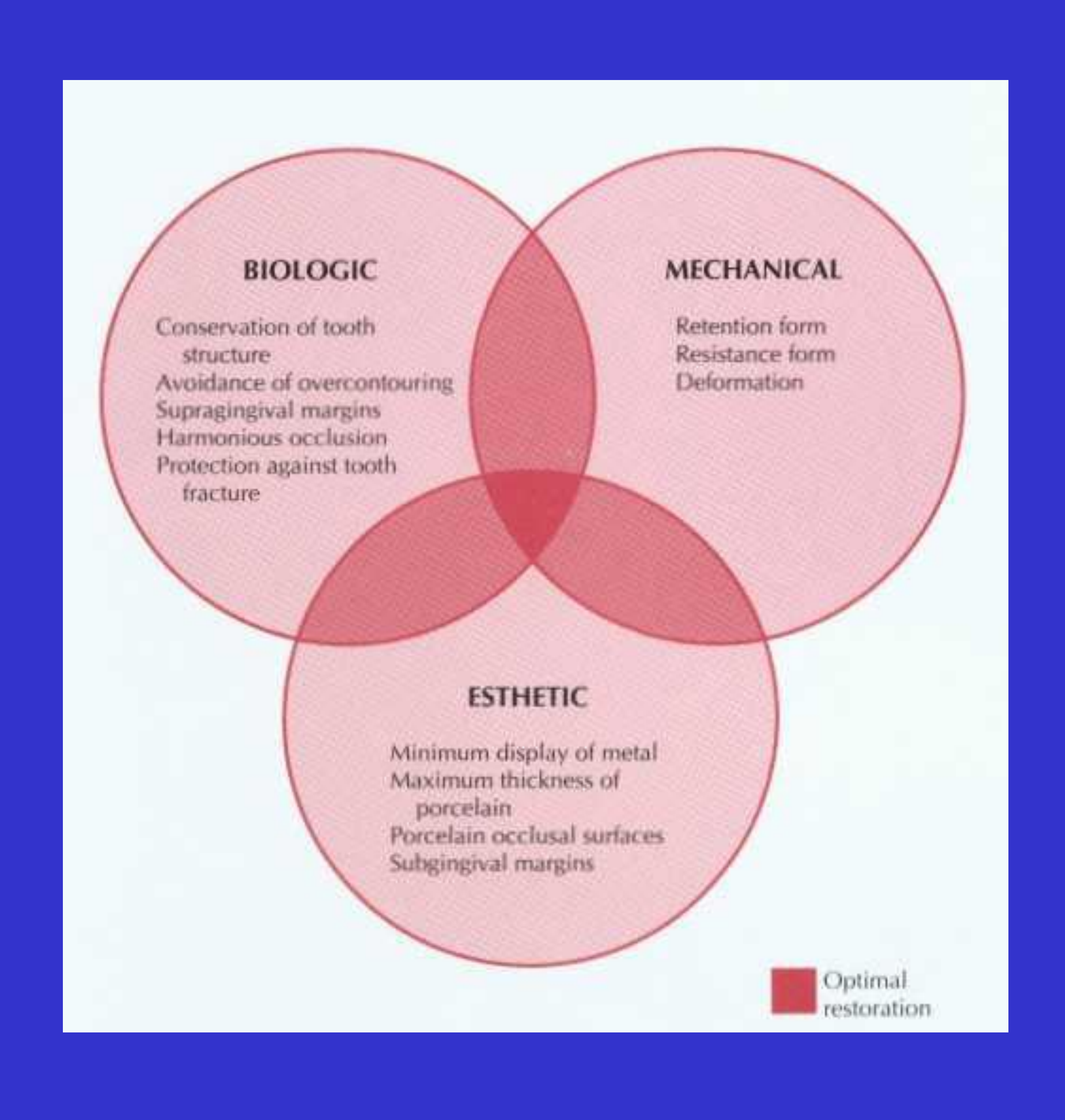


Principles of tooth preparation:

1-Biological consideration.

2-Mechanical consideration.

3-Esthetic consideration.



BIOLOGIC
Conservation of tooth structure
Avoidance of overcontouring
Supragingival margins
Harmonious occlusion
Protection against tooth fracture
MECHANICAL
Retention form
Resistance form
Deformation
ESTHETIC
Minimum display of metal
Maximum thickness of porcelain
Porcelain occlusal surfaces
Subgingival margins
Optimal restoration

Biological Consideration:

-Prevention of damaging during tooth preparation

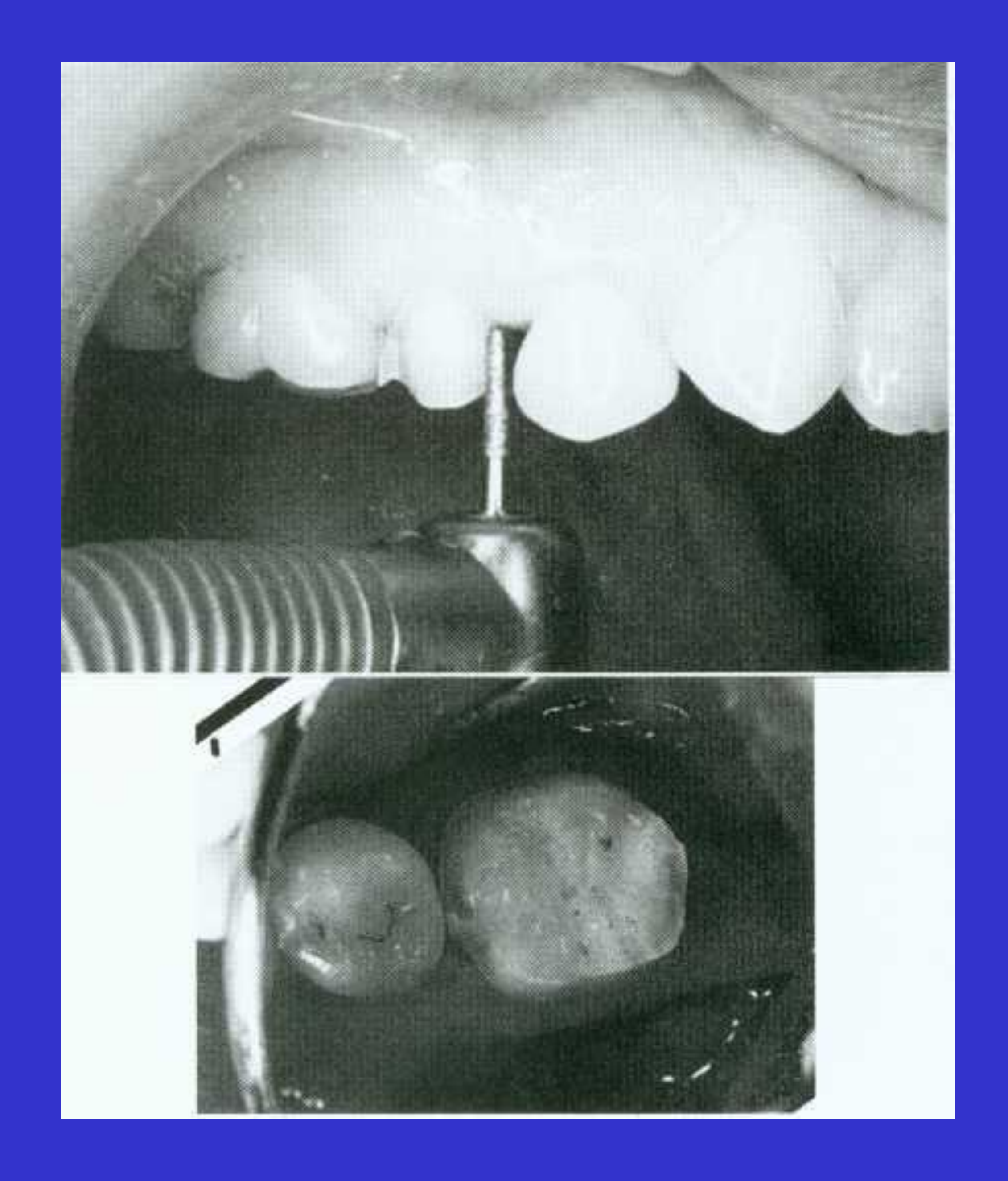
-Conservation of tooth structure

-Considerations affecting future dental health

Prevention of damaging during tooth preparation

- *adjacent teeth & soft tissues*

- *maintenance of pulp vitality*



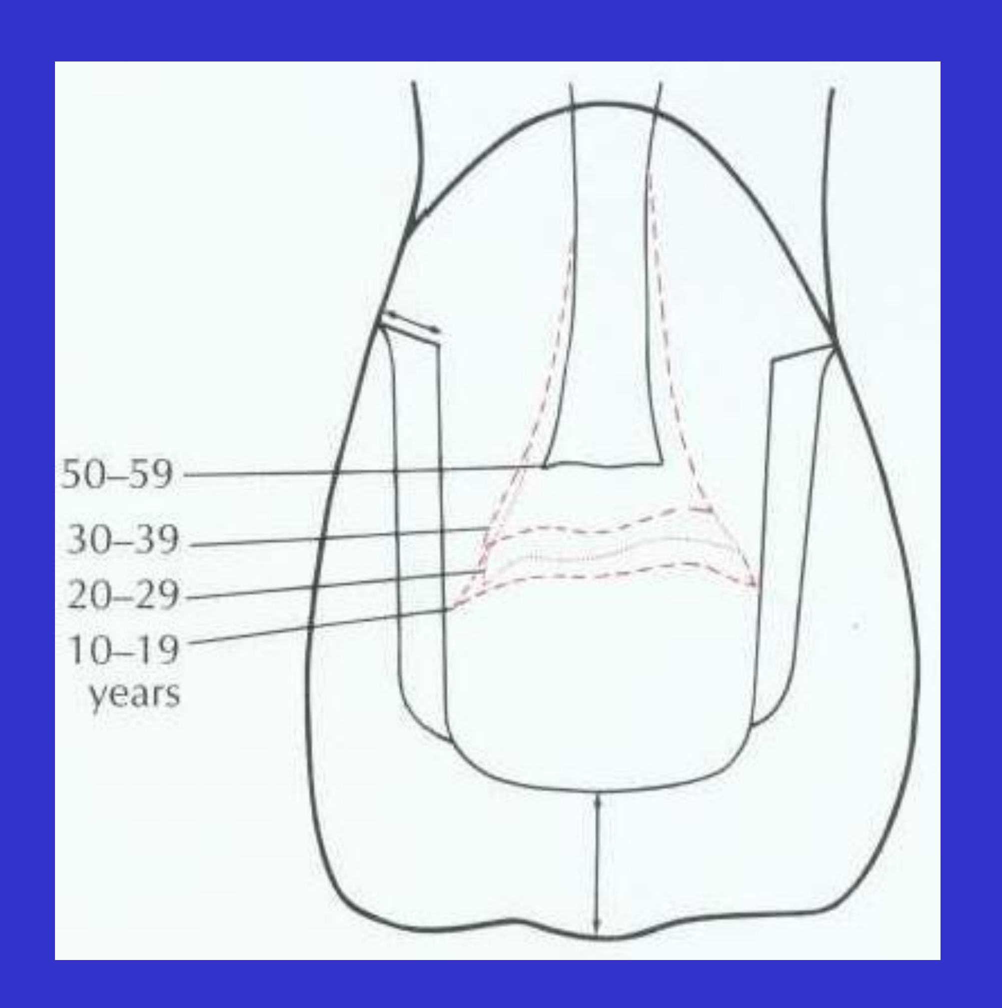


Pulp vitality affected by:

Temperature

Chemical Action

Bacterial Action



50–59
30–39
20–29
10–19
years

-Conservation of tooth structure

Tooth structure is conserved by using the following guidelines:

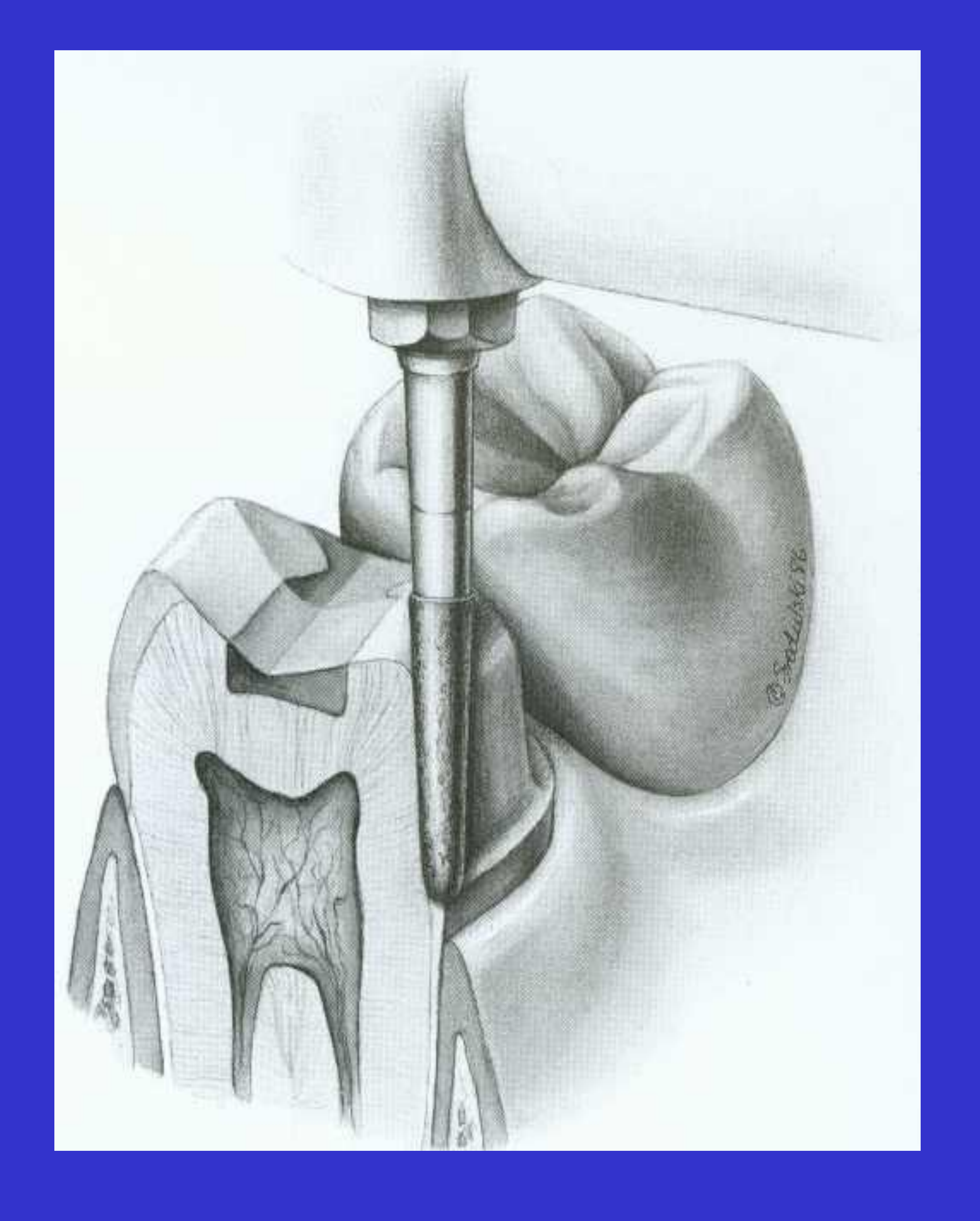
1. Use of partial-coverage rather than complete coverage Restorations

2. Preparation of teeth with the minimum practical convergence angle **(taper)** between axial Walls

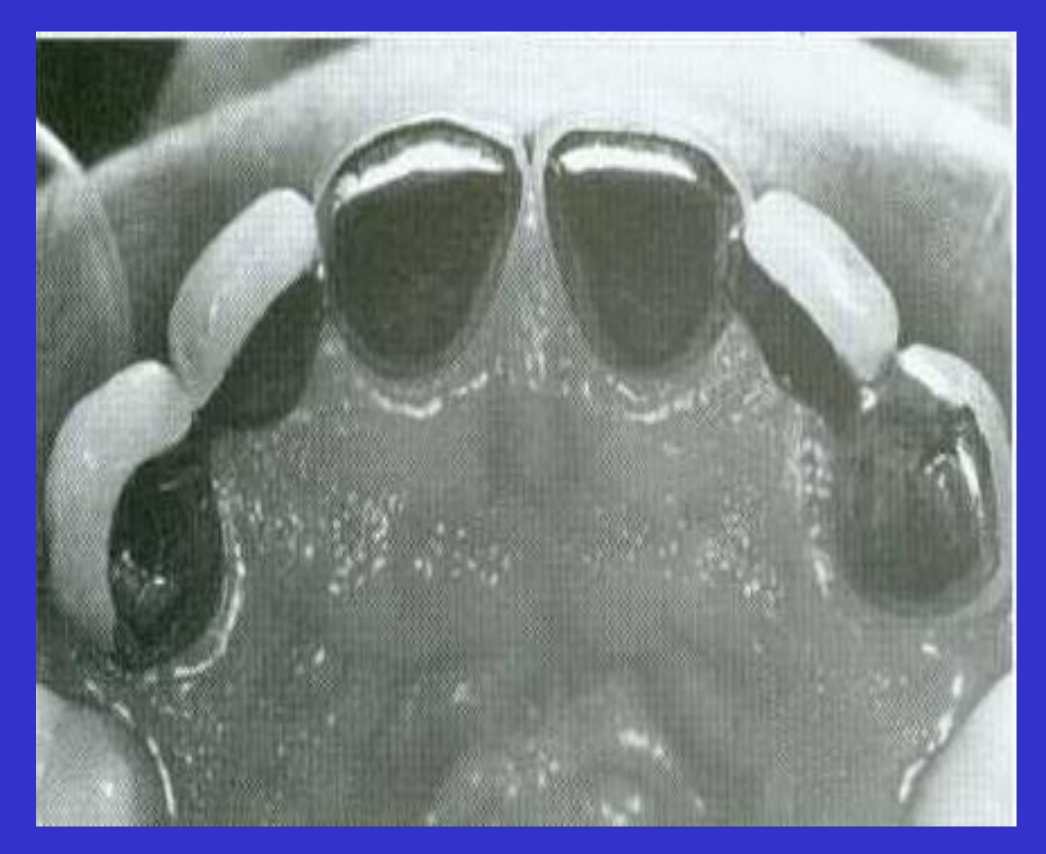
3. Preparation of the occlusal surface so reduction follows the anatomic planes to give uniform thickness in the restoration

5. Selection of a margin compatible with the other principles of tooth preparation

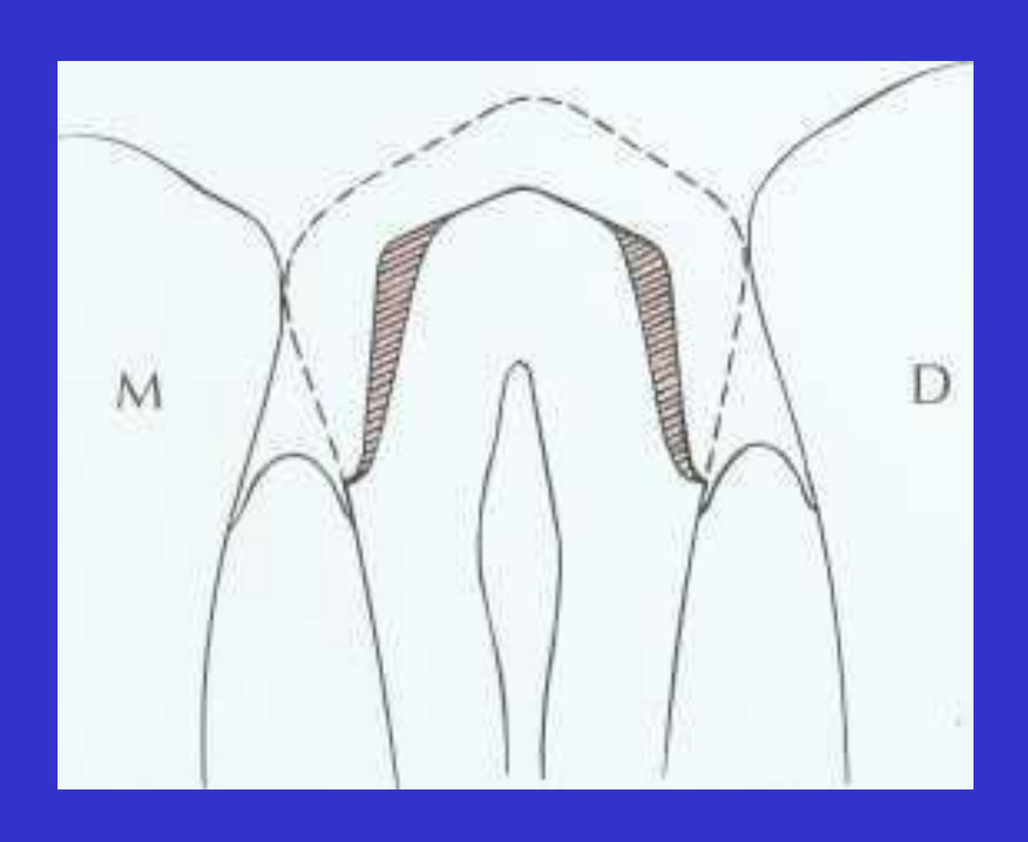
6. Avoidance of unnecessary apical extension of the preparation



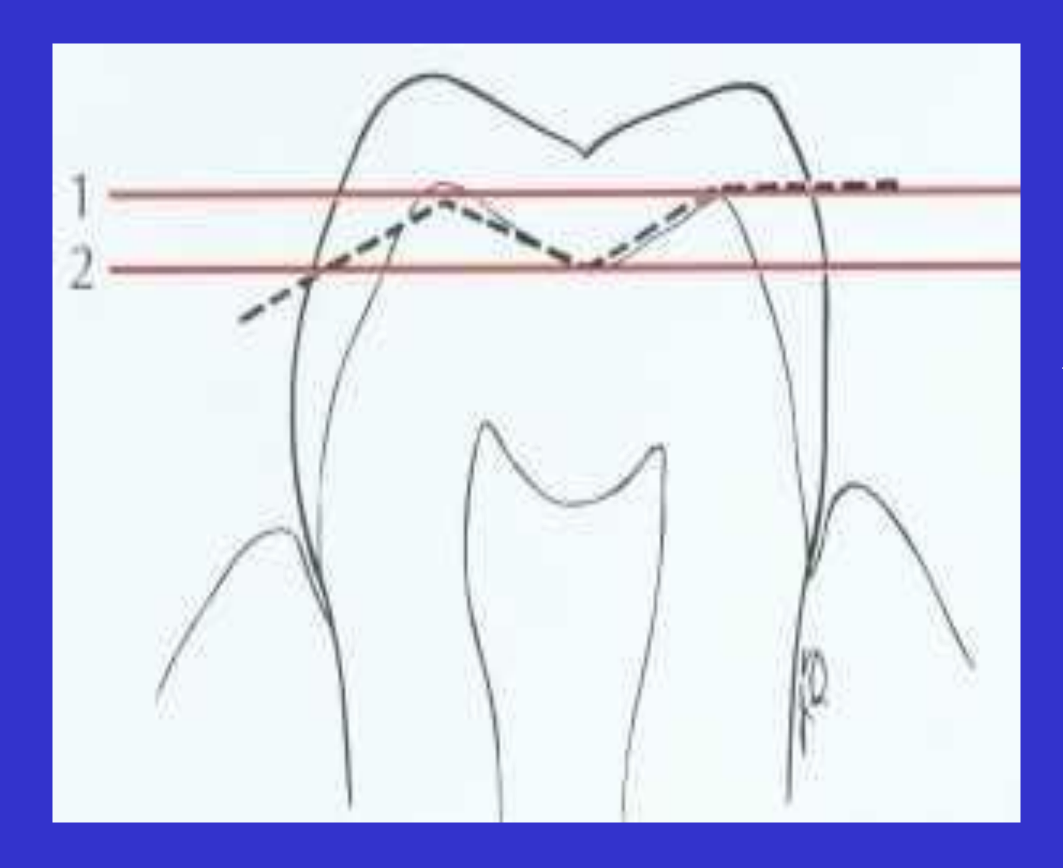
A considerable amount of care is needed when preparing a tooth for a complete crown because of the extensive nature of the reduction, with many dentinal tubules sectioned. Each tubule communicates directly with the dental pulp.



Conservation of tooth structure by using partial-coverage restorations



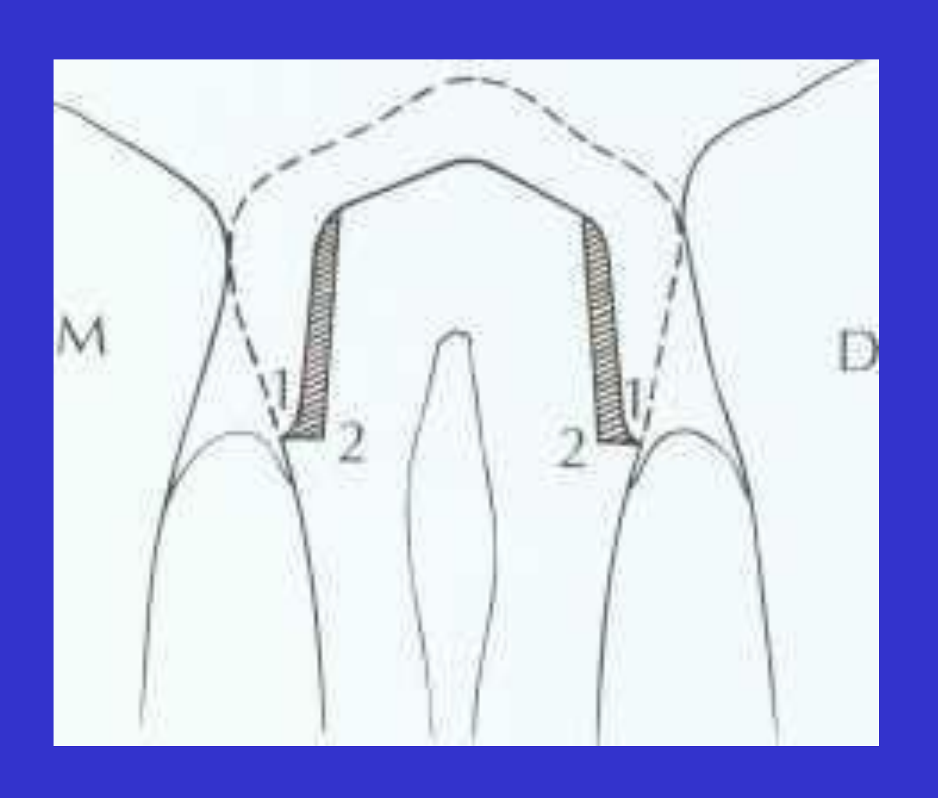
Excessive taper results in considerable loss of tooth structure *(shaded area)*.



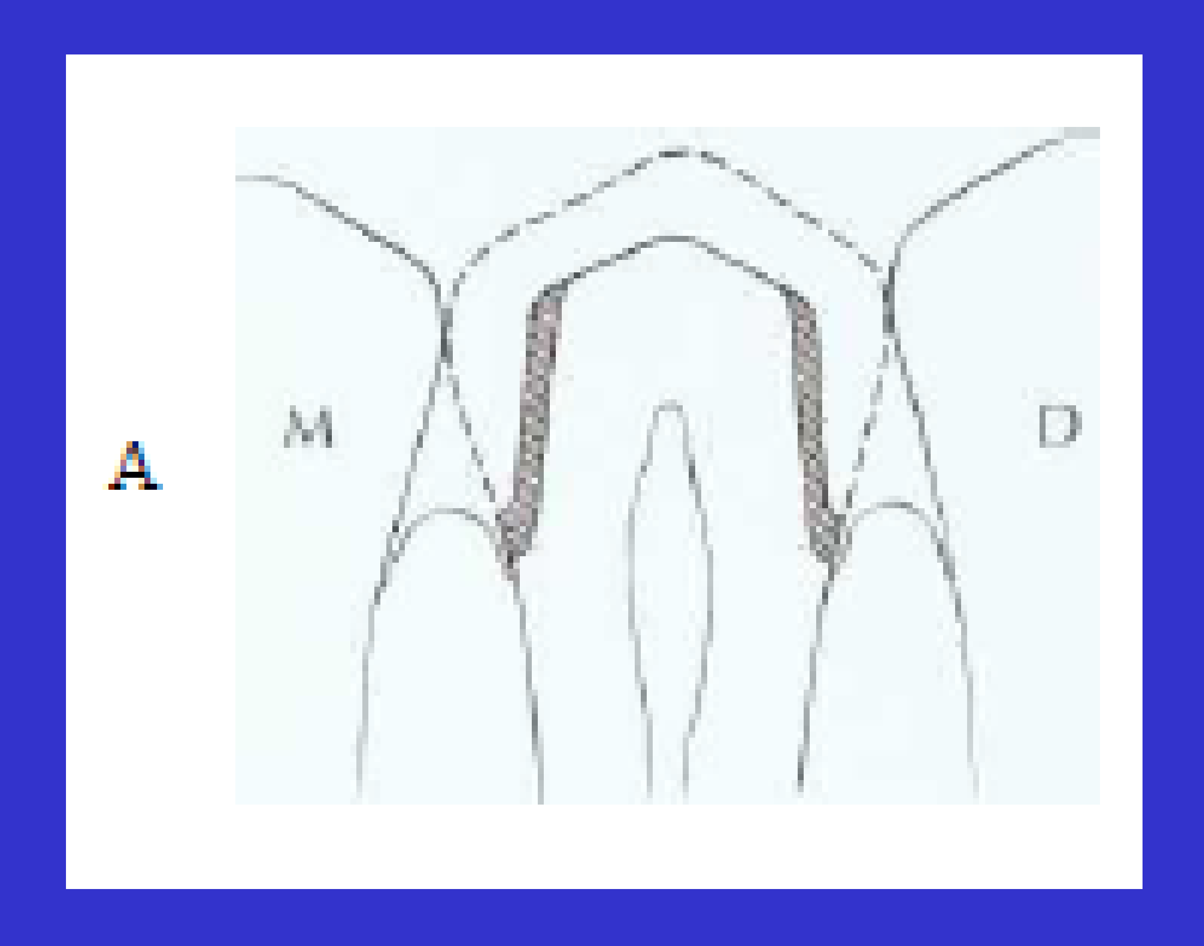
An anatomically prepared occlusal surface results in adequate clearance without excessive tooth reduction. A flat occlusal preparation will result in either (1) insufficient clearance or (2) an excessive amount of reduction.



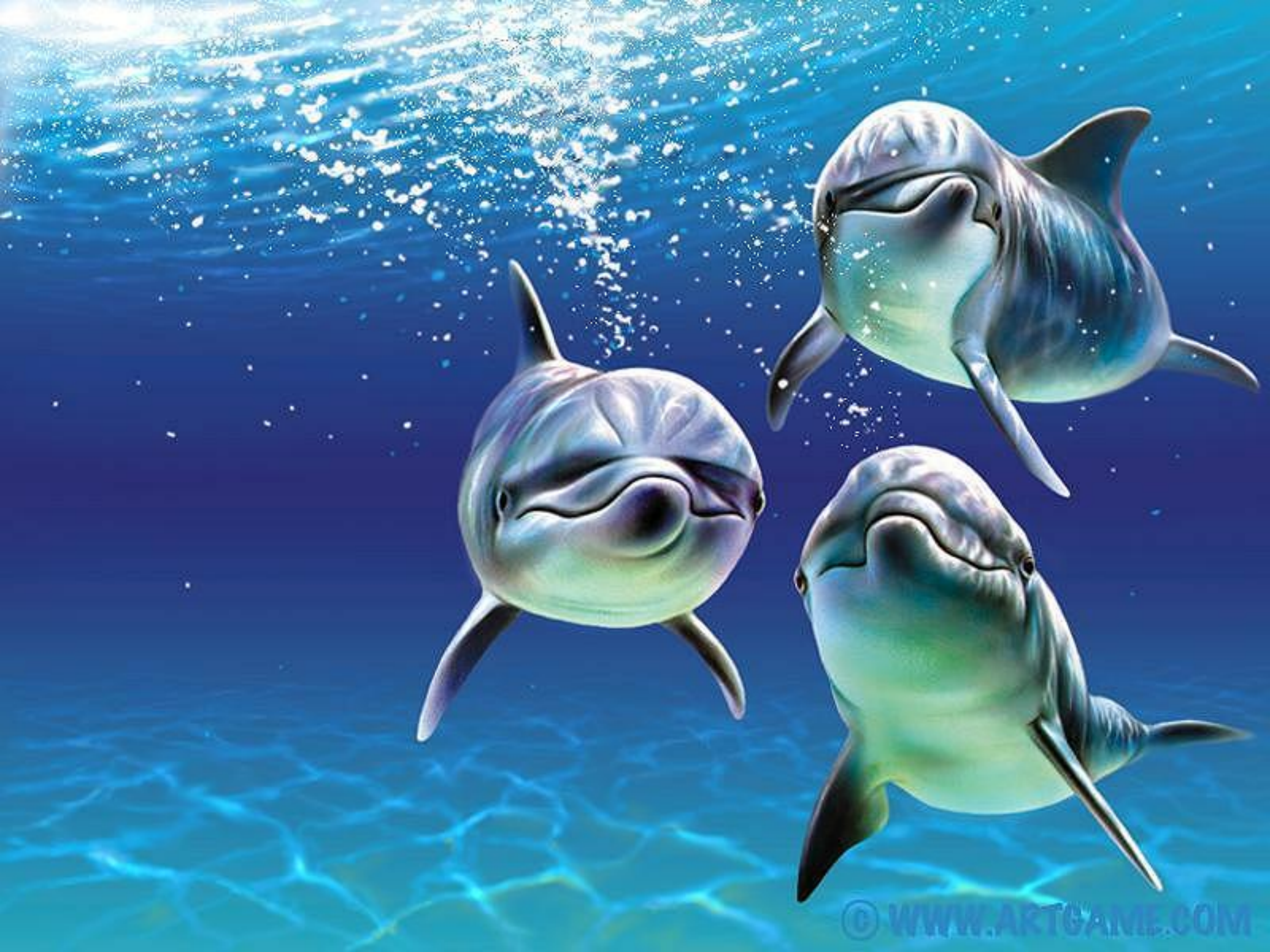
To conserve tooth structure, the preparation of axial surfaces should be as uniform as possible



A shoulder margin (2) is less conservative than a chamfer (1).



Apical extension of the preparation can necessitate additional tooth reduction.


© WWW.ARTGAME.COM

-Considerations affecting future dental health

-Axial Reduction.

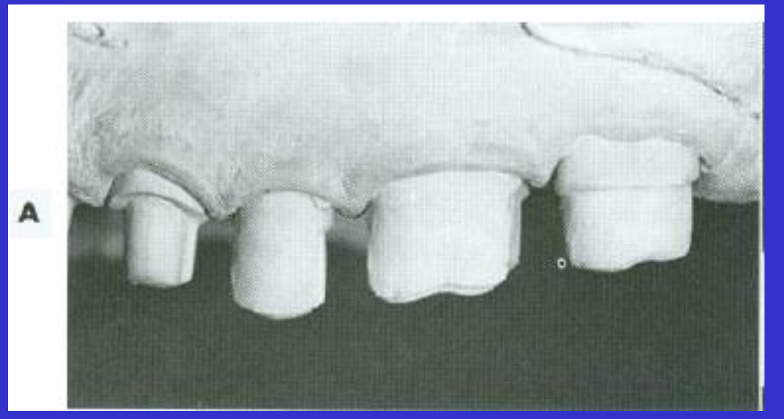
-Margin Placement.

-Margin Adaptation.

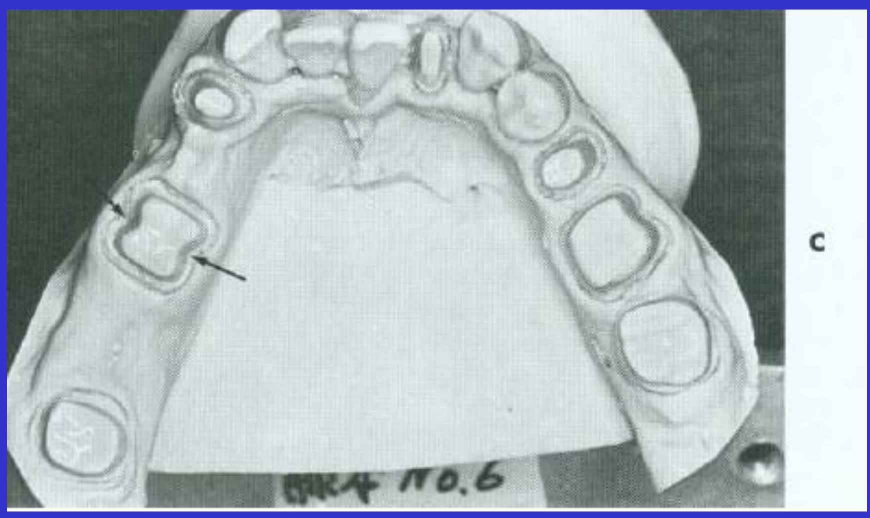
-Margin Geometry

-Occlusal Considerations.

-Preventing Tooth Fracture



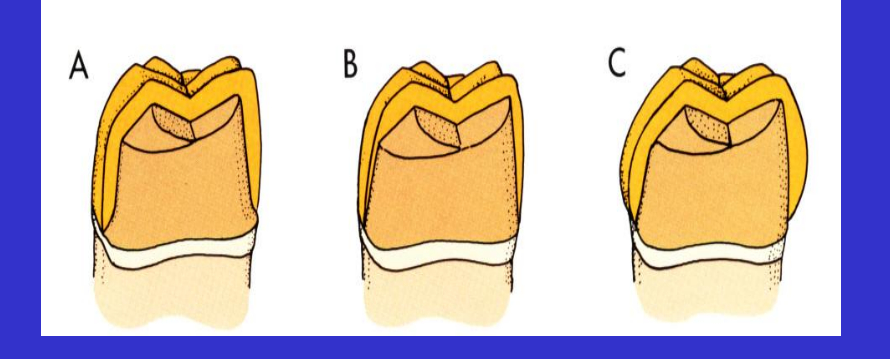




A and B, Tooth preparations with adequate axial reduction allow the development of properly contoured embrasures. C, Preparing furcation areas adequately is important; otherwise, the restoration will be excessively contoured

Axial reduction

- ***Adequate axial reduction is necessary***
- ***Inadequate axial reduction may lead to over contoured proximal surfaces or a thin walled restoration***



- Margin Placement

-<u>Supragingival</u>

1. They can be easily finished.

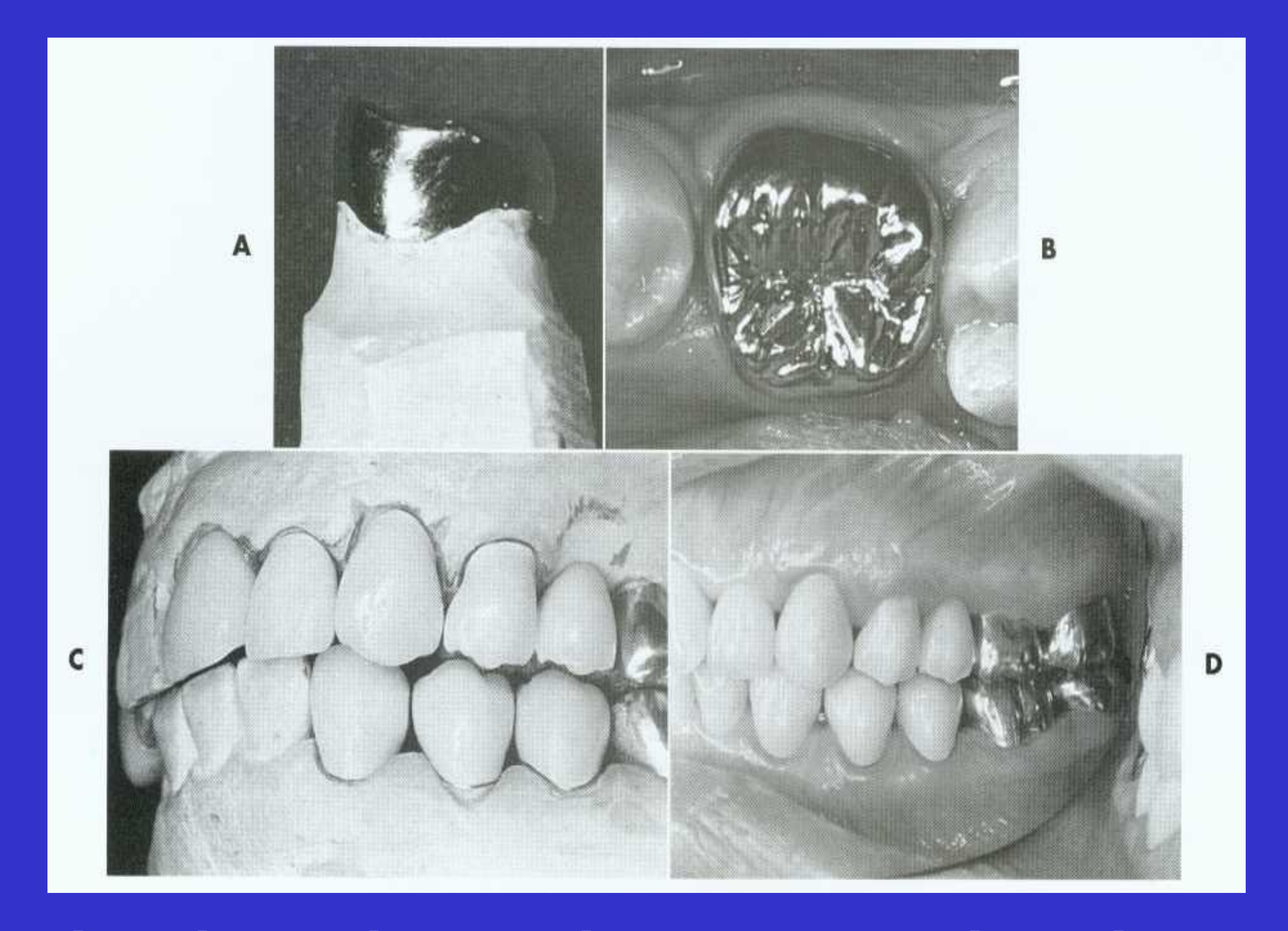
2. They are more easily kept clean.

3. Impressions are more easily made, with less potential for soft tissue damage.

4. Restorations can be easily evaluated at recall appointments.

- **subginigival margin**

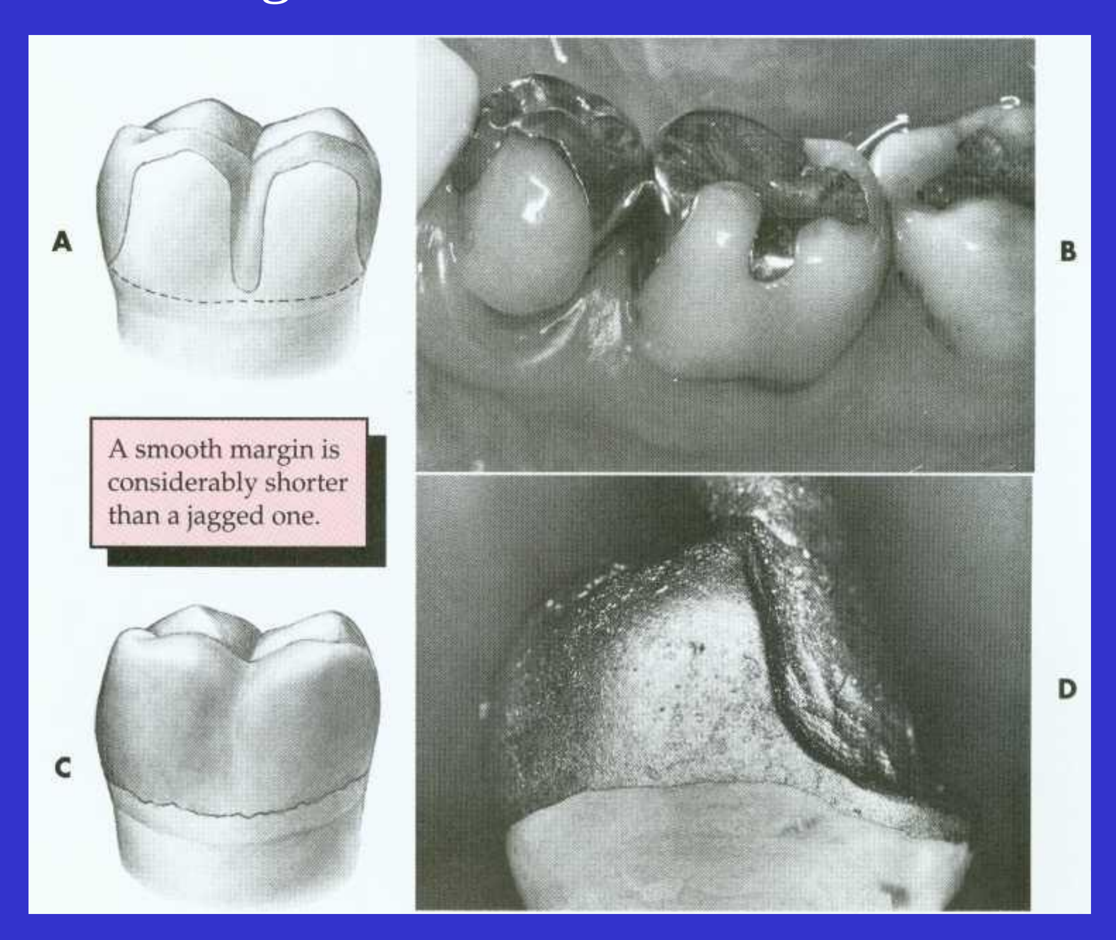
1. Dental caries, cervical erosion, or restorations extend subgingivally and a crown-lengthening procedure is not indicated.
2. The proximal contact area extends to the gingival crest.
3. Additional retention is needed.
4. The margin of a metal-ceramic crown is to be hidden behind the labiogingival crest.
5. Root sensitivity
6. Modification of the axial contour is indicated



Examples where subgingival margins are indicated. A, To include an existing restoration. B, To extend apical to the proximal contact (adequate proximal clearance). C and D, To hide the metal collar of metal-ceramic crowns.

Margin Adaptation

A skilled technician can make a casting that fits to with in 10 u and a porcelain margin that fits to within 50 um



Margin Geometry

The following guidelines for margin design should be considered:

1. Ease of preparation without overextension or unsupported enamel

2. Ease of identification in the impression and on the die

3. A distinct boundary to which the wax pattern can be finished

4. Sufficient bulk of material (to enable the wax pattern to be handled without distortion and to give the restoration strength and, when porcelain is used, esthetics)

5. Conservation of tooth structure (provided the other criteria are met)

Margin designs

Proposed margin designs are:

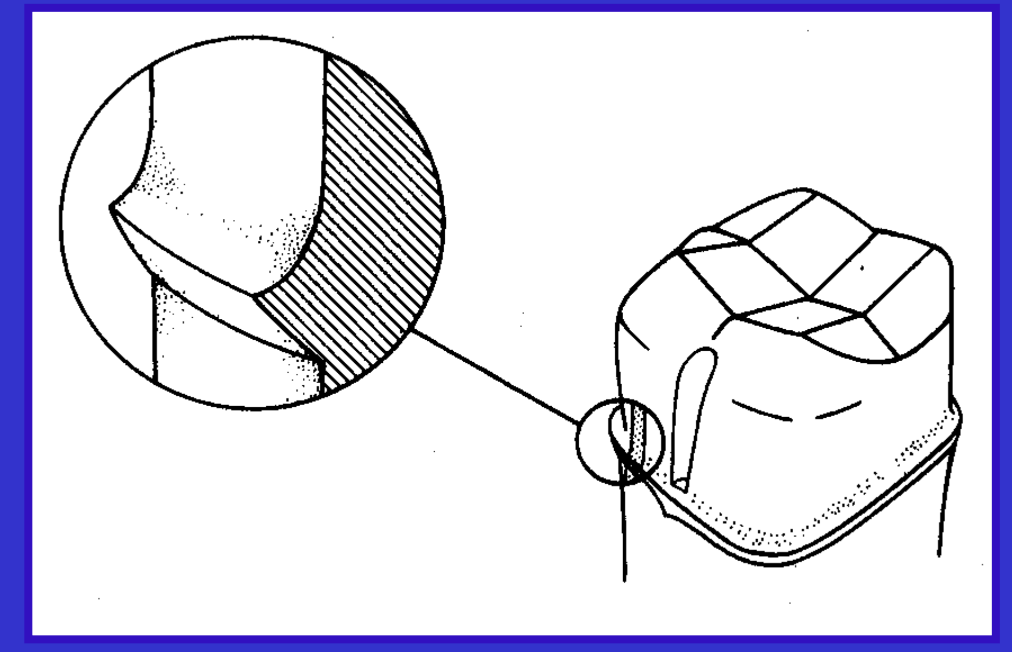
- *Chamfer*
- *Heavy chamfer*

- *Shoulder*
- *Radial shoulder*

- *Shoulder with bevel*
- *Knife edge*

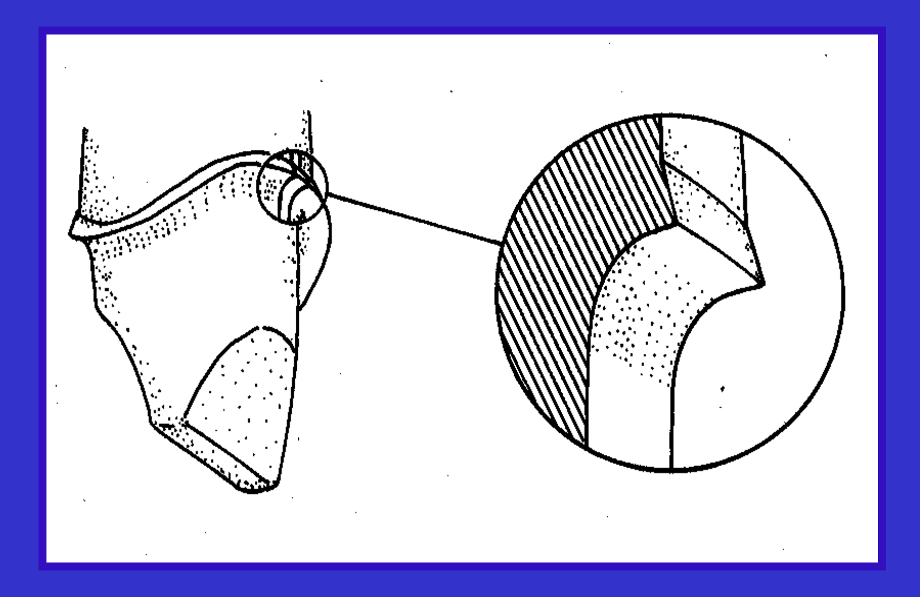
Chamfer

- *Preferred finish line for metal restorations*
- *Exhibits least stress*
- *Can be prepared using round end tapered / torpedo diamond*



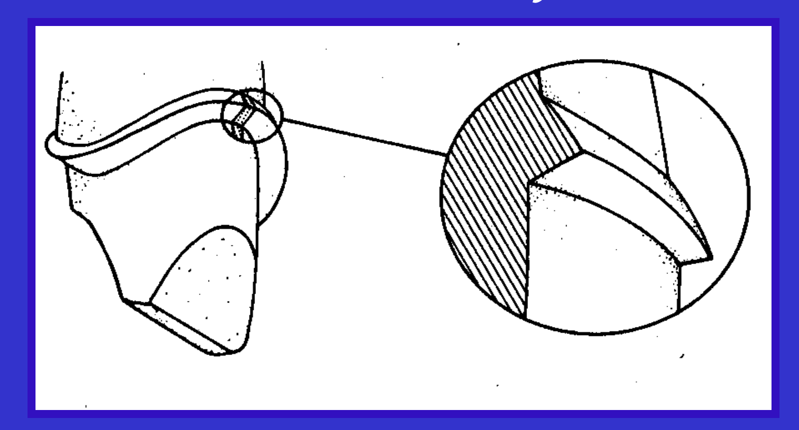
Heavy chamfer

- *Has a 90 degree angle*
- *Provides better support than does a conventional chamfer*



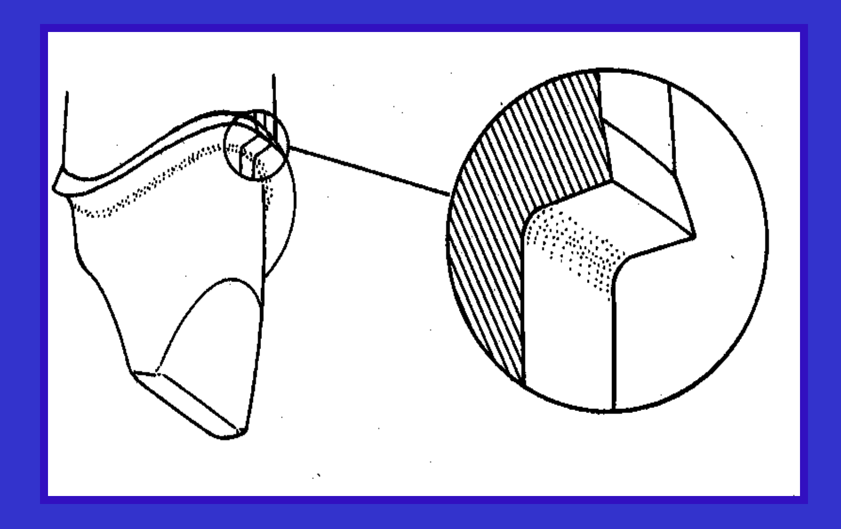
Shoulder

- *Finish line of choice for all ceramic crowns*
- *Wide ledge provides resistance to occlusal forces & minimizes stress*
- *Provides maximum esthetics*
- *Flat end tapered diamond is used*
- *Requires more destruction of tooth structure*



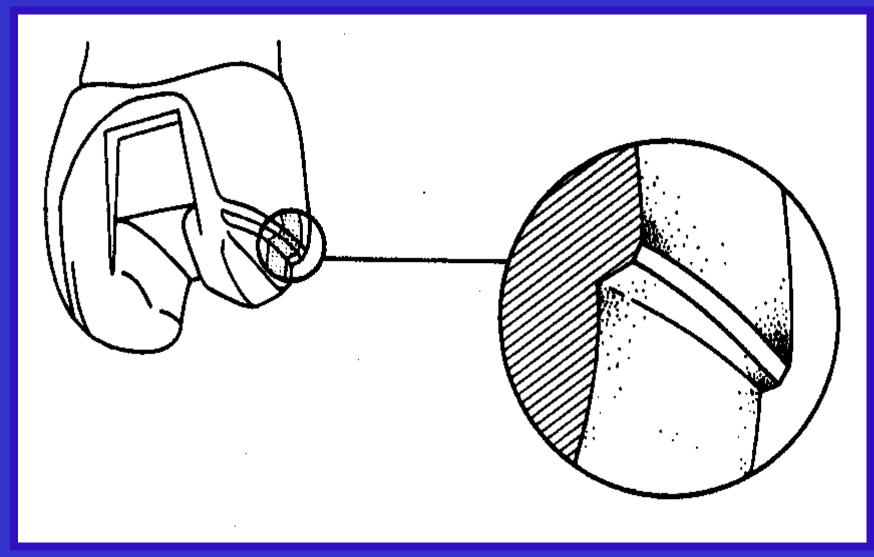
Radial shoulder

- *Modified form of shoulder finish line*
- *Decreased stress concentration than shoulder*



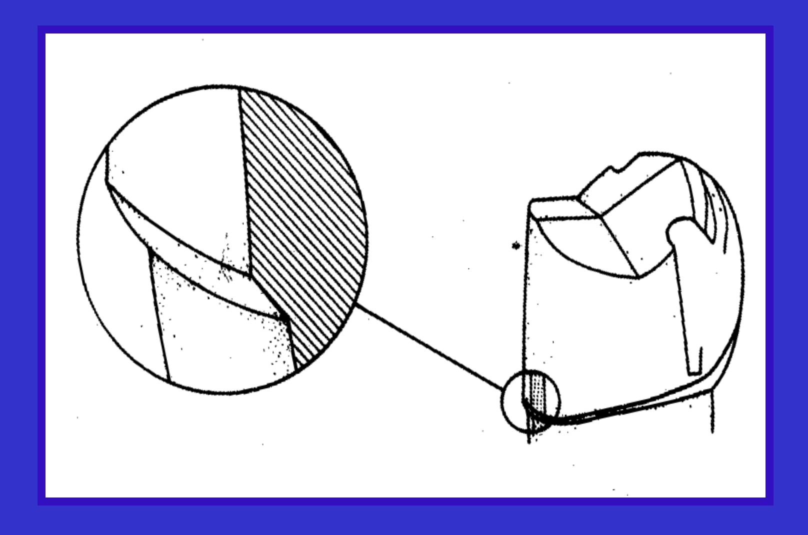
Shoulder with bevel

- *A bevel is created on the margin of the finish line*
- *Used as a finish line on the proximal box of inlays & onlays and in mandibular ¾ crowns*



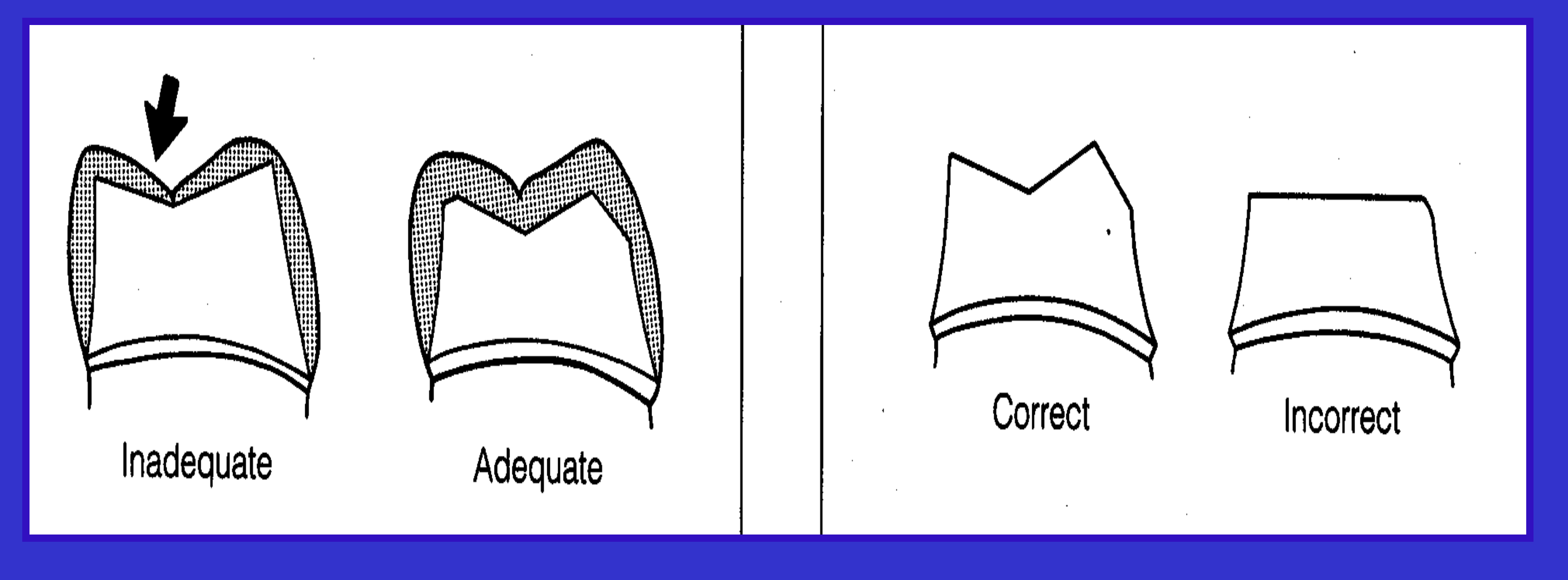
Knife edge

- *Extremely thin finish line*
- *Mainly used in lingual surfaces of mandibular posterior teeth, teeth with very convex axial surface & tilted teeth*



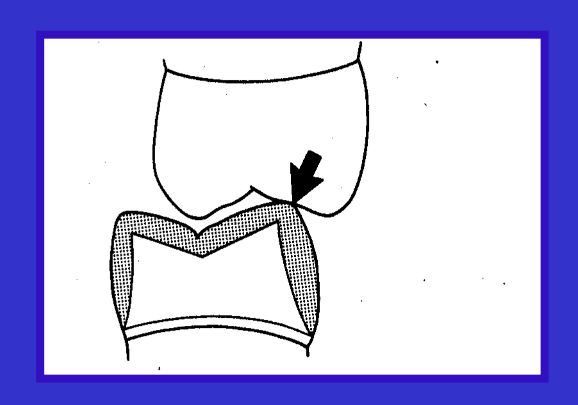
Occlusal considerations

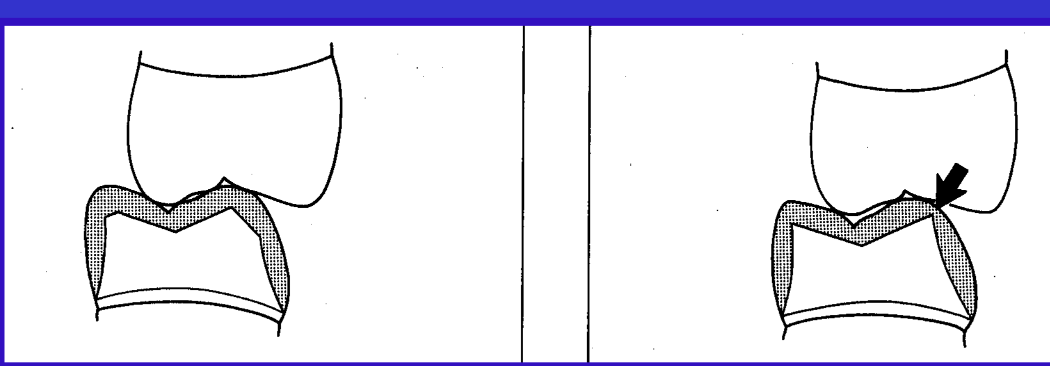
- *"Occlusal clearance" is the most important feature for providing adequate bulk of metal & strength to the restoration*

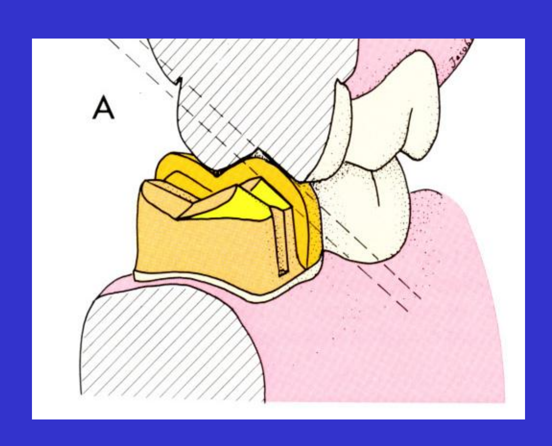


Functional cusp bevel

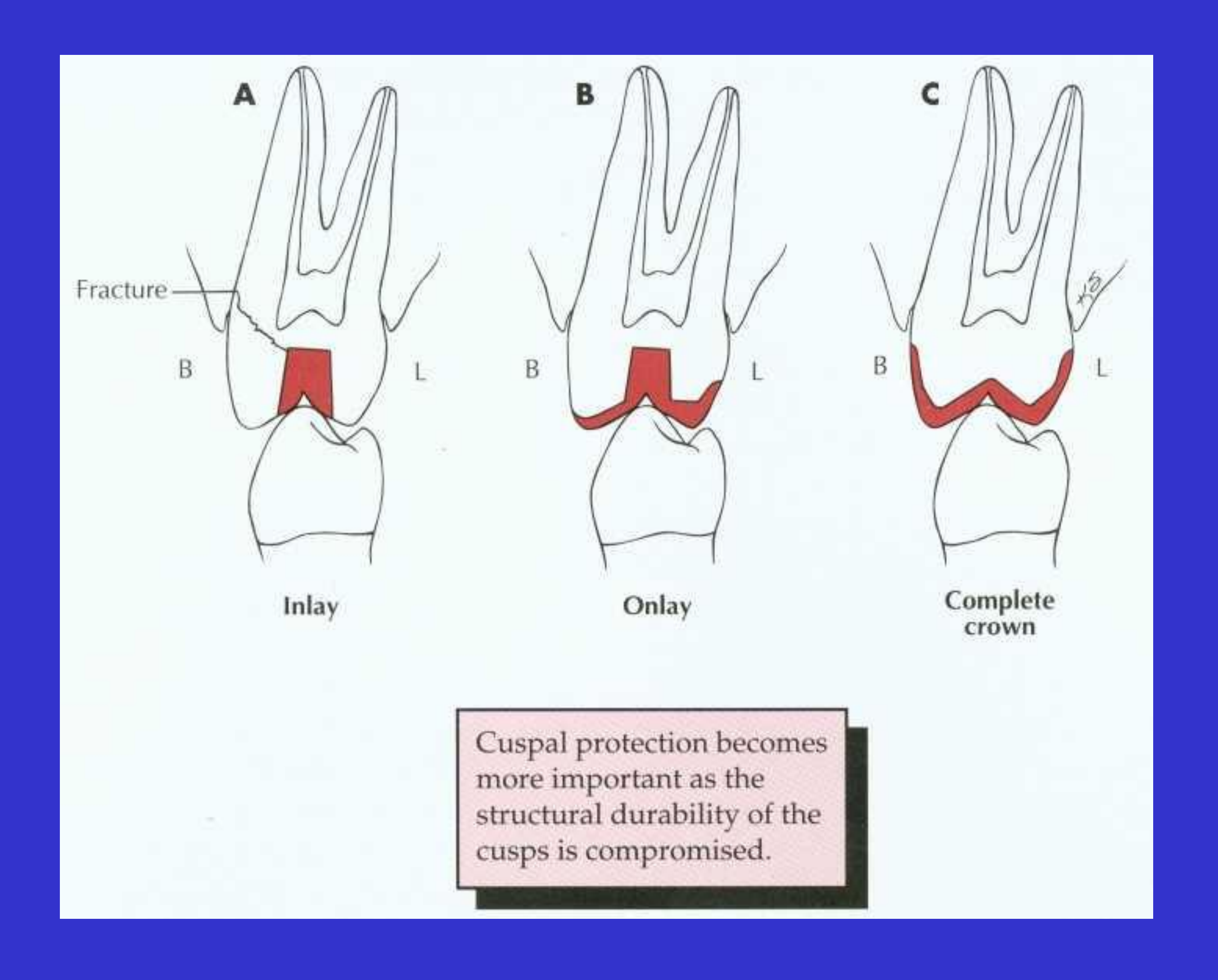
- *An integral part of occlusal reduction is the functional cusp bevel*
- *Ranges from 30 – 45 degrees*







Preventing Tooth Fracture





MECHANICAL CONSIDERATIONS

Mechanical considerations can be divided into three categories:

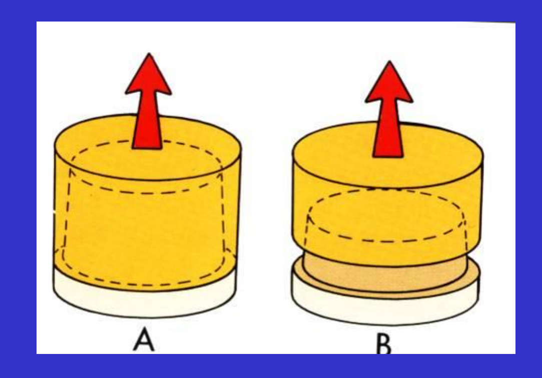
1. Providing retention form

2. Providing resistance form

3. Preventing deformation of the restoration

RETENTION FORM

•Retention prevents removal of the restoration along the path of insertion or long axis of the tooth preparation.



The following factors must be considered when deciding whether retention is adequate for a given fixed restoration:

1. Magnitude of the dislodging forces
2. Geometry of the tooth preparation
3. Roughness of the fitting surface of the restoration
4. Materials being cemented
5. The luting **agent**

Geometry of the Tooth Preparation

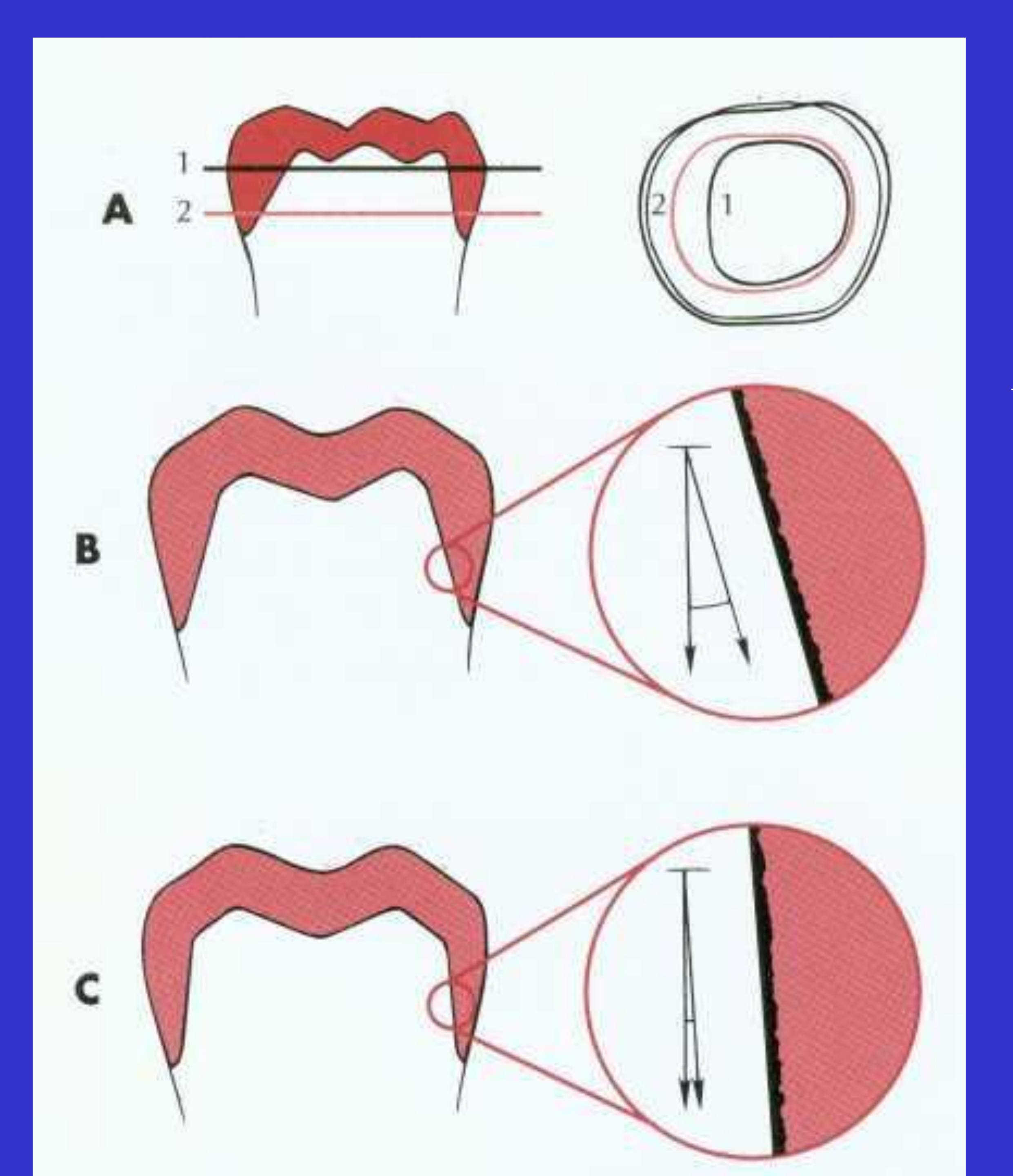
Taper

Surface Area

Stress Concentration

Type of Preparation

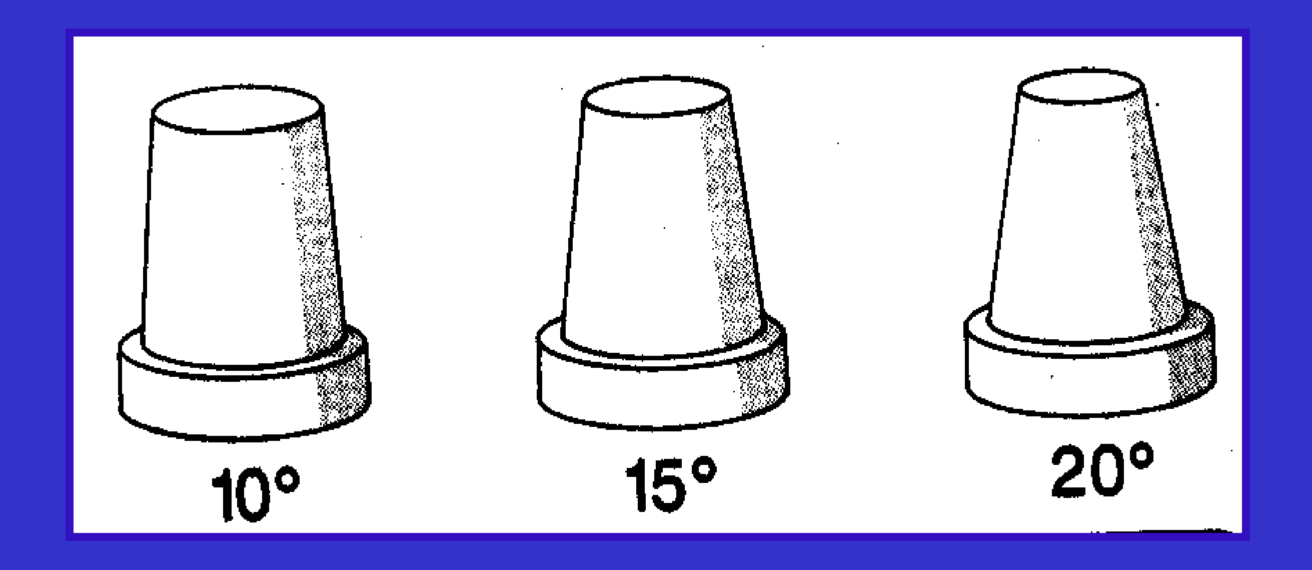
Path of insertion



Convergence angle within 6 degree

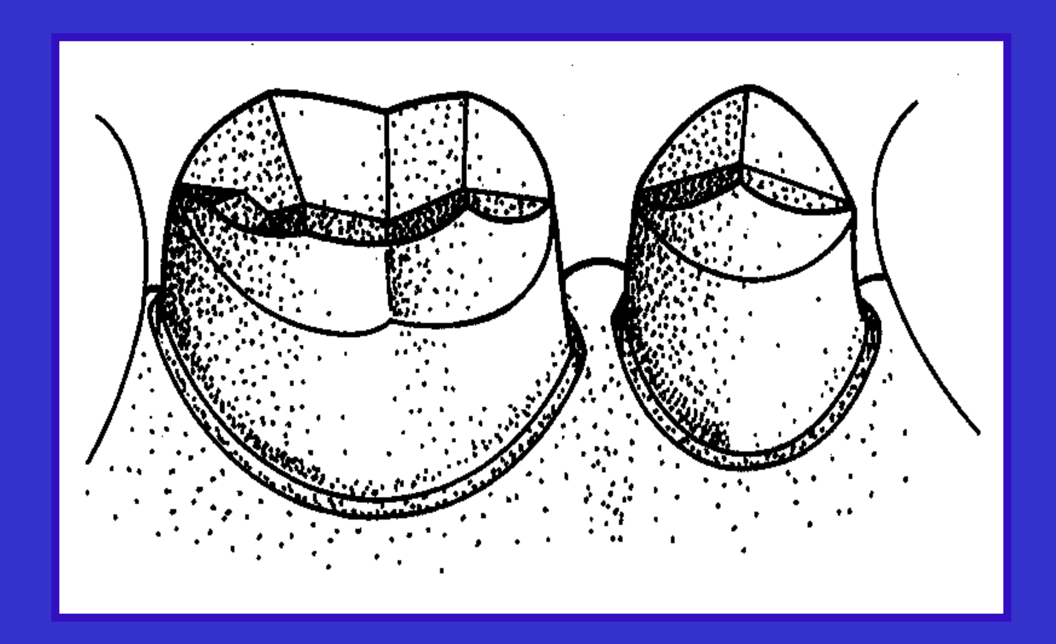
Taper

- *Parallel walls – maximum retention*
- *Ideal taper is 6 degrees (10 – 22 degrees)*
- *> taper = < retention*



Surface Area

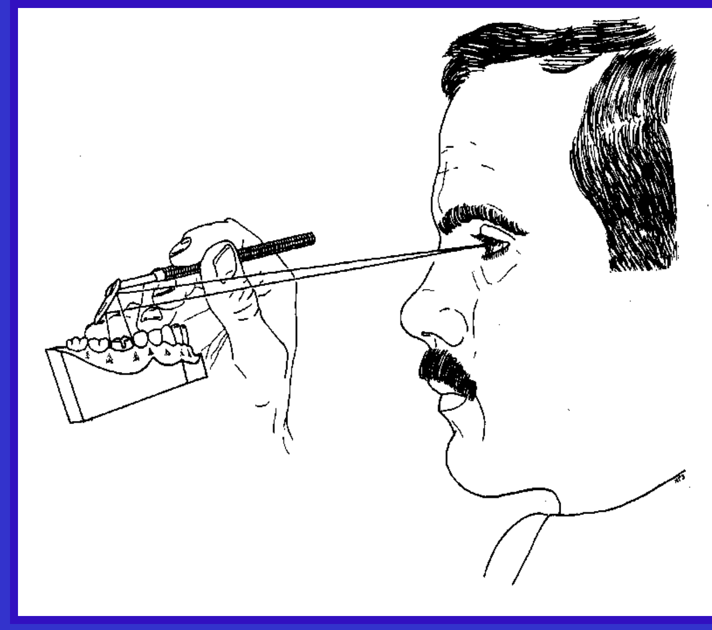
- *One more factor to be considered is the "surface area" of the preparation*
- *> surface area = > retention*



Path of insertion

- *Imaginary line along which the restoration will be placed onto or removed from the preparation*
- *Viewed in 2 dimensions*





Roughness of the fitting surface of the restoration

The casting is most effectively prepared by air-abrading the fitting surface with 50 um of alumina.

Materials Being Cemented

base metal alloys are better retained than less reactive high-gold content metals

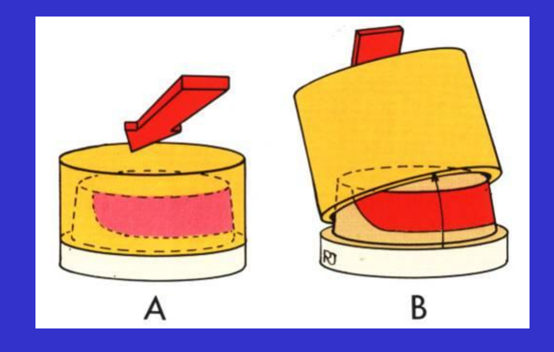
Type of Luting Agent

In general, the data suggest that adhesive resin cements are the most retentive


(c) 1999 by moses art worX www.qraft.de

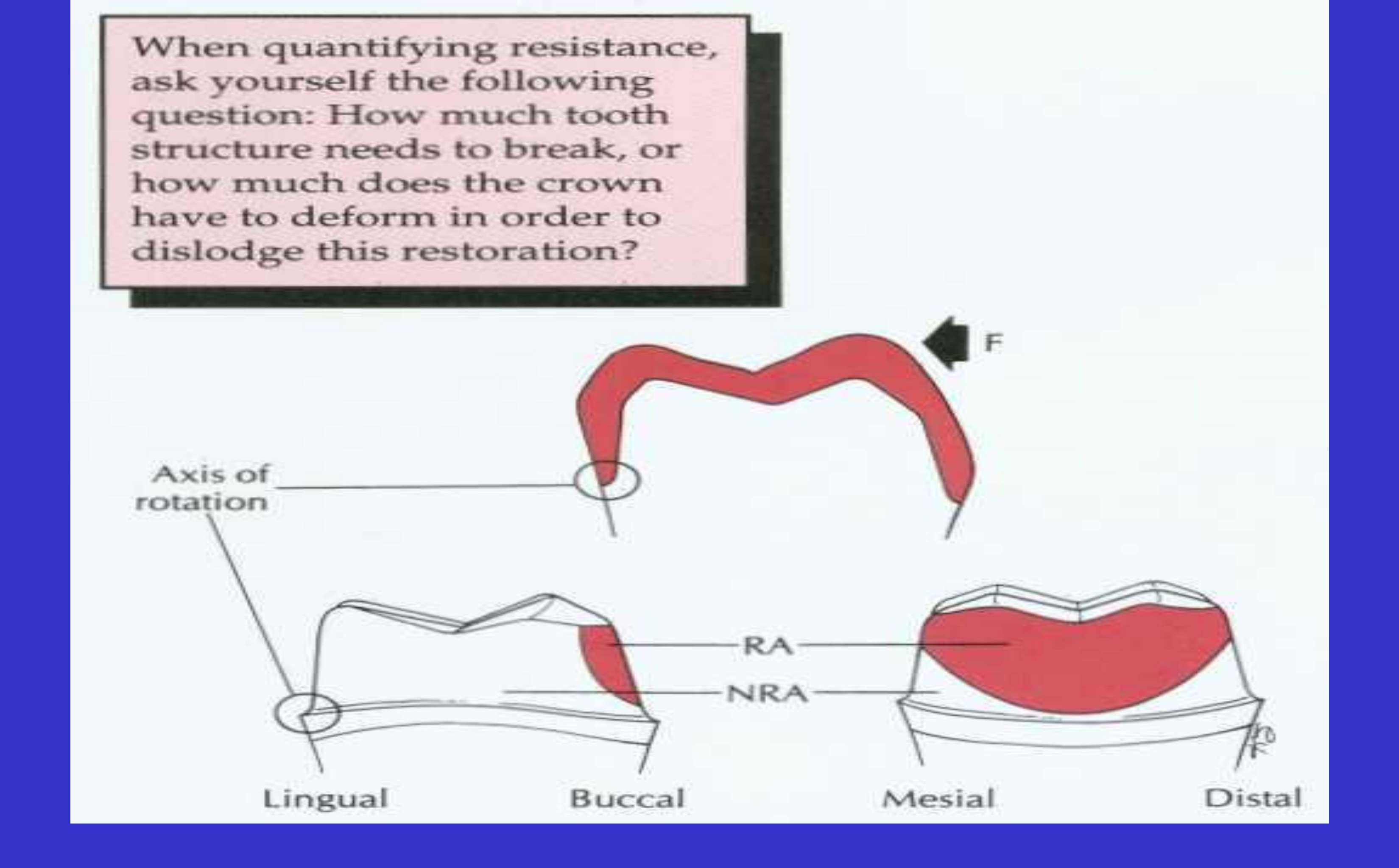
RESISTANCE FORM

- Resistance prevents dislodgement of the restoration by forces directed in an apical or oblique direction and prevents any movement of the restoration under occlusal forces.



Adequate resistance depends on the following:

1. Magnitude and direction of the dislodging forces
2. Geometry of the tooth preparation
3. Physical properties of the luting agent



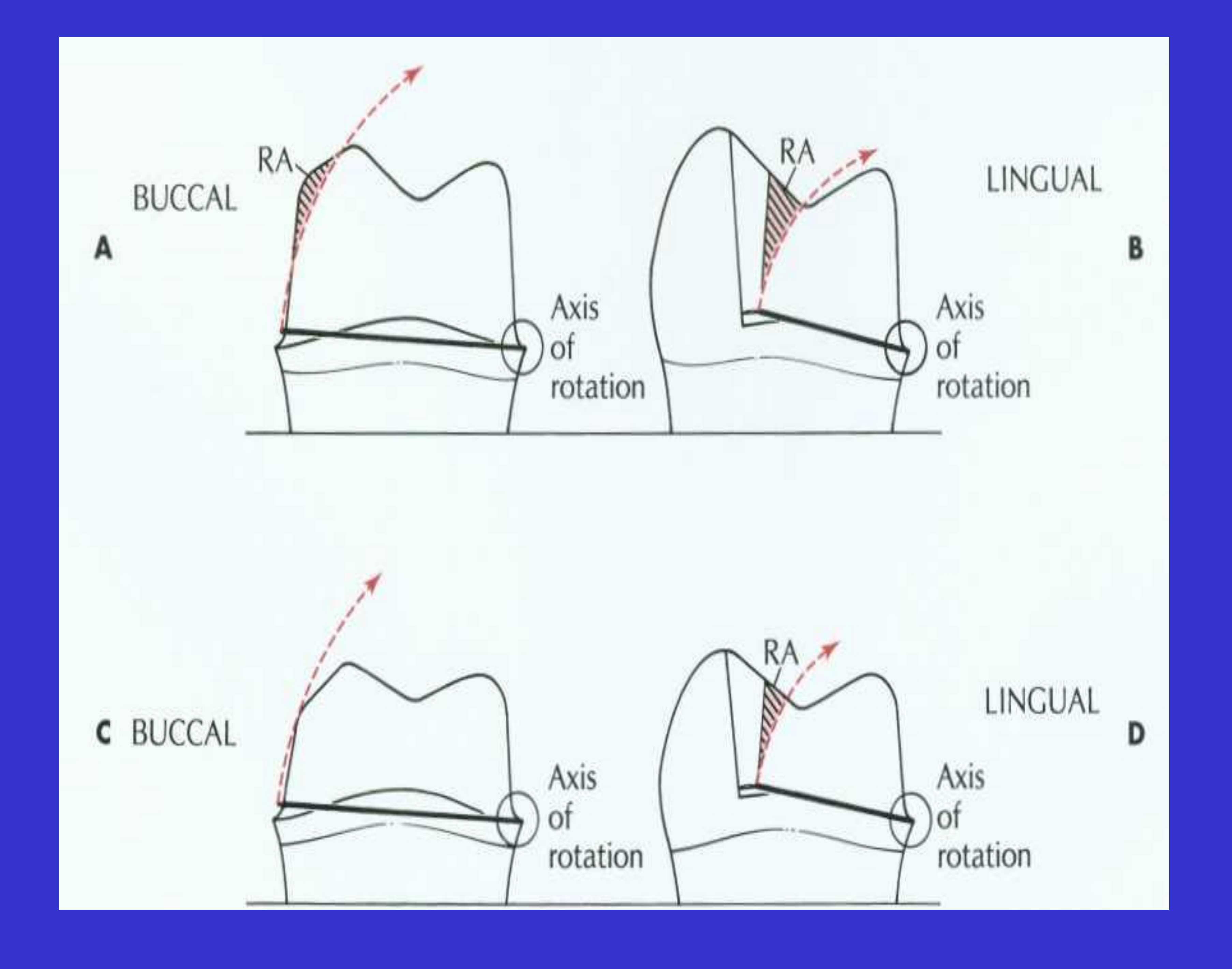
The resistance area *(RA)* of a complete crown is placed under compression when a lateral force (F) is applied. *NRA*, No resisting area.

Magnitude and direction of the dislodging forces

. normal force
. abnormal force

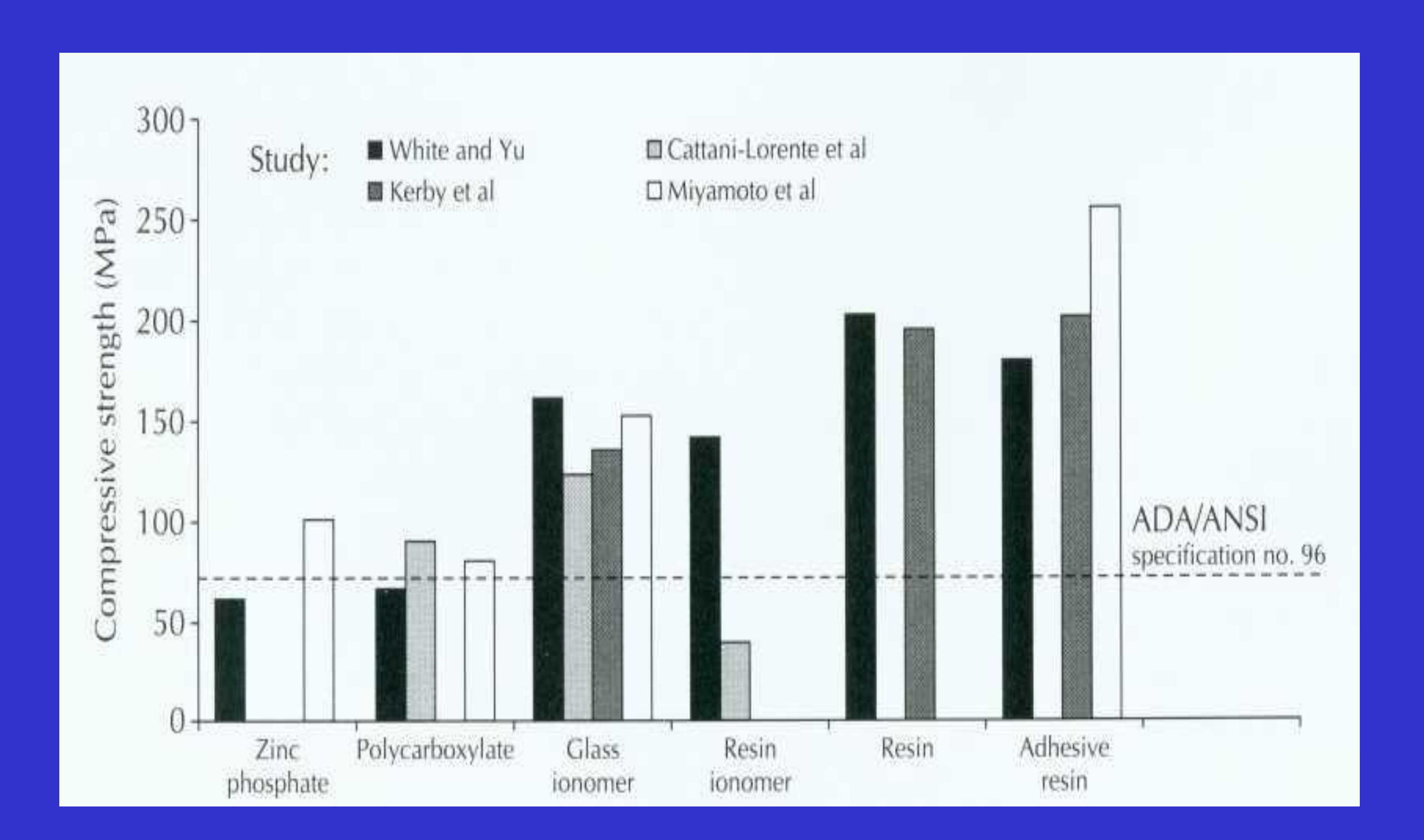
Geometry of the tooth preparation

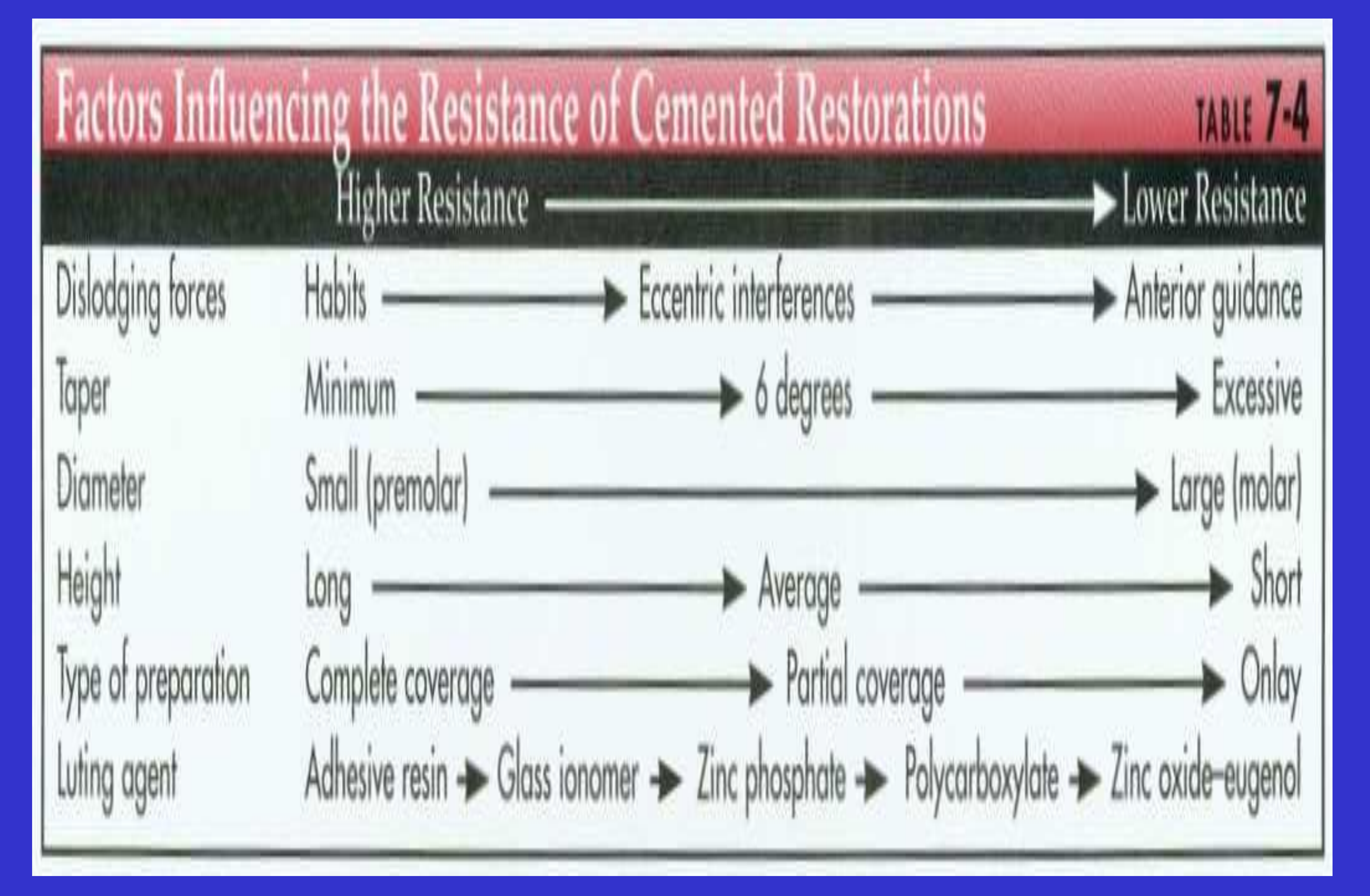
. length of walls
. partial coverage vs. complete coverage


A
BUCCAL
RA
Axis of rotation
B
LINGUAL
RA
Axis of rotation
C
BUCCAL
Axis of rotation
D
LINGUAL
RA
Axis of rotation

Physical properties of the luting agent

.Compressive strength and modulus of elasticity





Factors Influencing the Resistance of Cemented Restorations — TABLE 7-4

	Higher Resistance →				Lower Resistance
Dislodging forces	Habits →		Eccentric interferences →		Anterior guidance
Taper	Minimum →		6 degrees →		Excessive
Diameter	Small (premolar) →				Large (molar)
Height	Long →		Average →		Short
Type of preparation	Complete coverage →		Partial coverage →		Onlay
Luting agent	Adhesive resin →	Glass ionomer →	Zinc phosphate →	Polycarboxylate →	Zinc oxide–eugenol


MISSISSIPPI
QUEEN
Howard Birnbaum - http://www.3d-webdesign.com

DEFORMATION

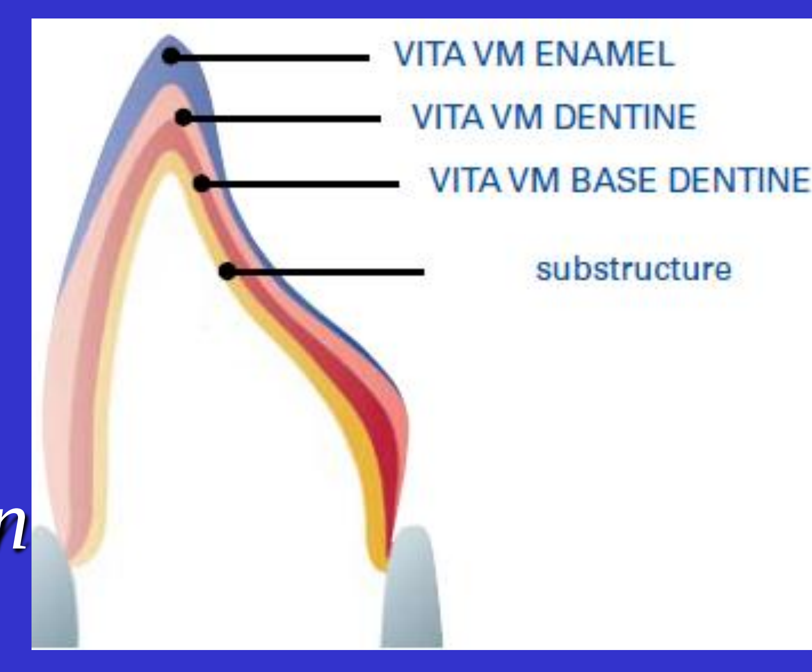
. *Alloy Selection*
. *Adequate Tooth Reduction*
. *Margin Design.*

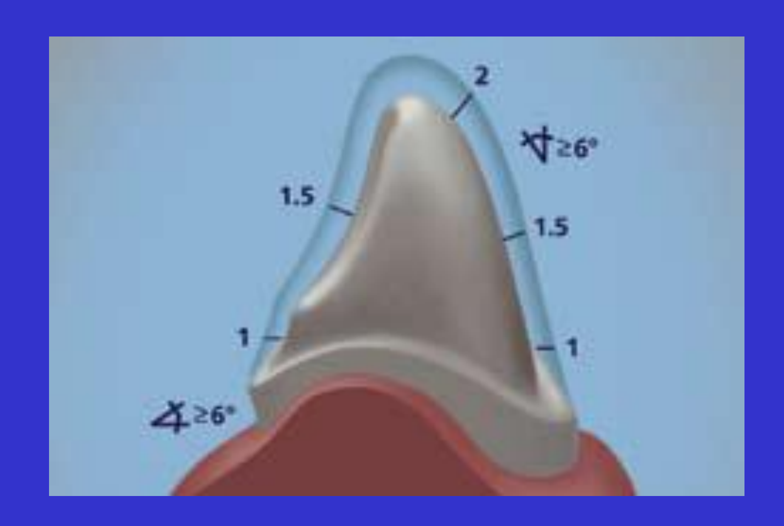
ESTHETIC CONSIDERATIONS

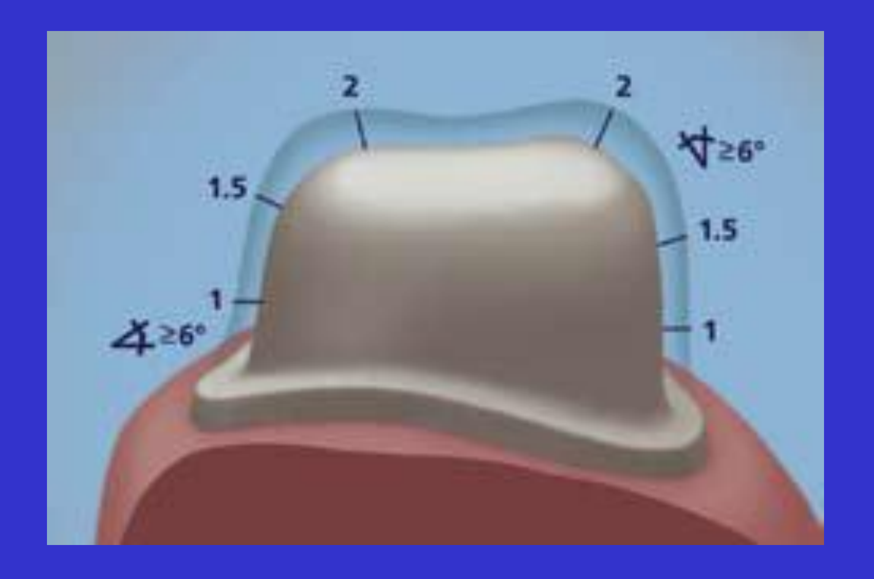
- *minimal display of metal*

- *increase thickness of porcelain*

- *shade match*




2
∢≥6°
1.5
1.5
1
1
∢≥6°


2
2
∢≥6°
1.5
1.5
1
∢≥6°
1



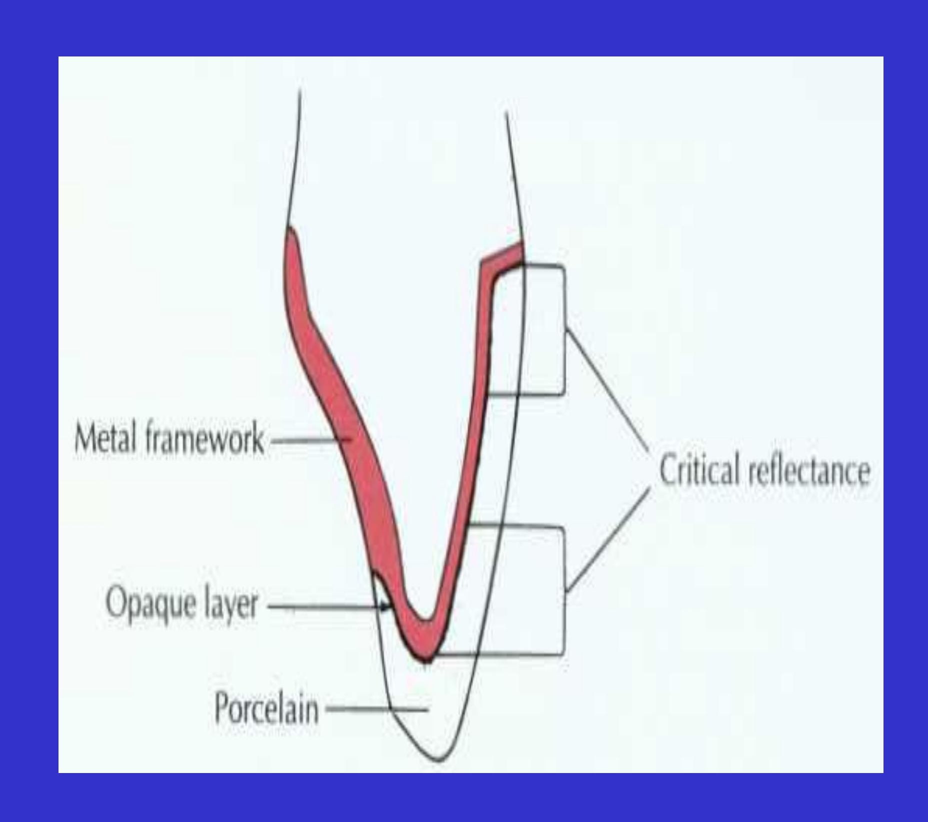



VITA



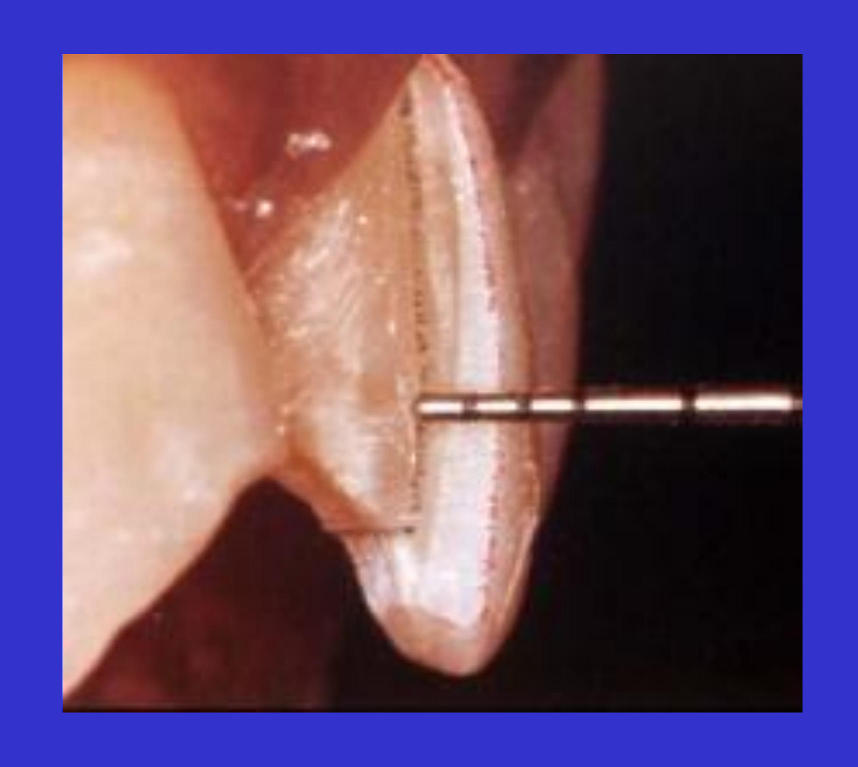
Defective Color Shading

METAL-CERAMIC RESTORATIONS

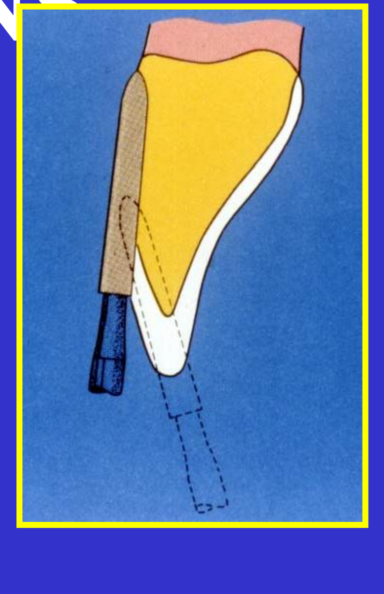


ANTERIOR METAL-CERAMIC CROWNS

A UNIFORM REDUCTION OF APPROXIMATELY 1.2MM IS NEEDED OVER THE ENTIRE FACIAL SURFACE.



ANTERIOR METAL-CERAMIC CROWNS

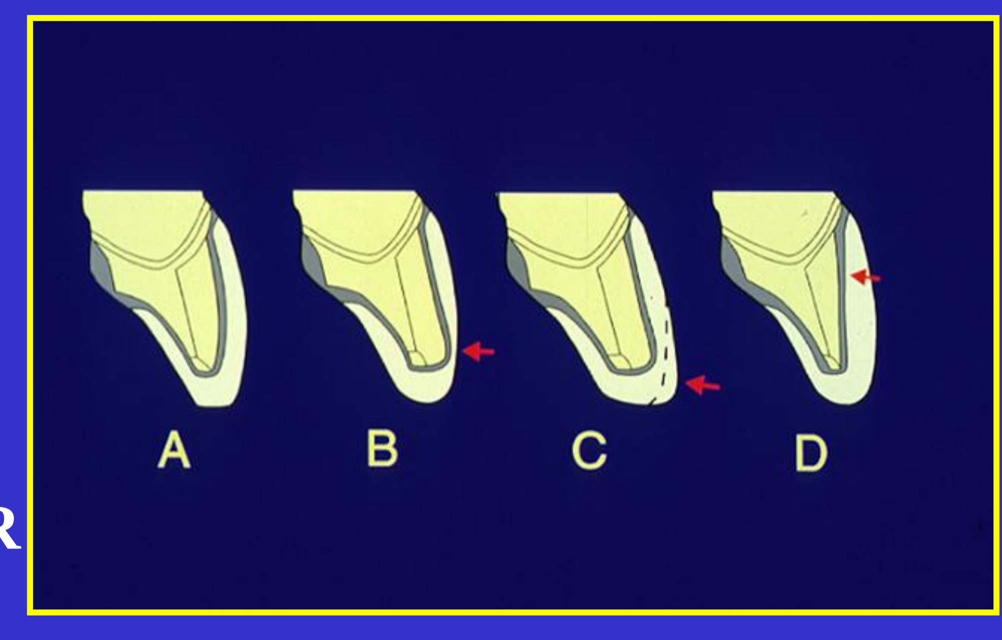


TO ACHIEVE ADEQUATE REDUCTION WITHOUT ENCROACHING UPON THE PULP – FACIAL SURFACE PREPARED IN TWO PLANES THAT CORRESPOND ROUGHLY TO THE TWO GEOMETRIC PLANES PRESENT ON THE FACIALSURFACE OF AN UNCUT TOOTH



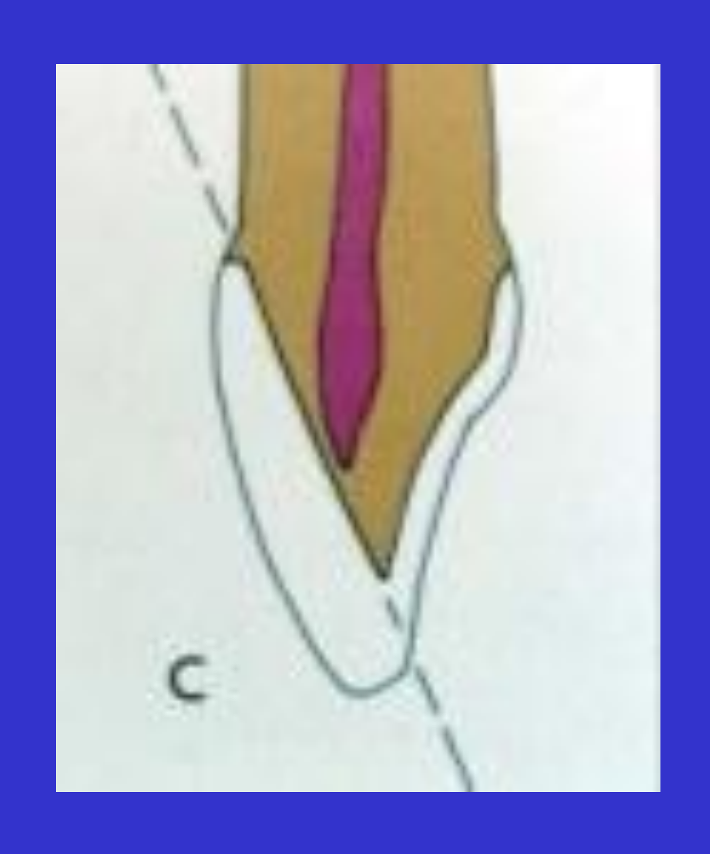
ANTERIOR METAL-CERAMIC CROWNS

FACIAL SURFACE IS PREPARED IN A SINGLE PLANE THAT IS AN EXTENSION OF THE GINGIVAL PLANE – INCISAL EDGE WILL PROTRUDE RESULTING IN BAD SHADE MATCH OR OVERCONTOURED "BLOCK".



ANTERIOR METAL-CERAMIC CROWNS

FACIAL SURFACE PREPARED IN ONE PLANE THAT HAS ADEQUATE FACIAL REDUCTION IN THE INCISAL ASPECT- FACIAL SURFACE OVERTAPERED AND TOO CLOSE TO THE PULP.



ANTERIOR METAL-CERAMIC CROWN PREPARATION

FACIAL MARGIN

1. DEEP CHAMFER
2. SHOULDER WITH BEVEL
3. SHOULDER
4. RADIAL SHOULDER

ANTERIOR METAL-CERAMIC CROWN PREPARATION

IMPROVED ESTHETICS

ALL CERAMIC LABIAL MARGIN

THIS ELIMINATES THE METAL COLLAR AT THE FACIOGINGIVAL MARGIN OF THE FINISHED METAL-CERAMIC RESTORATION

ANTERIOR CROWN METAL-CERAMIC PREPARATION

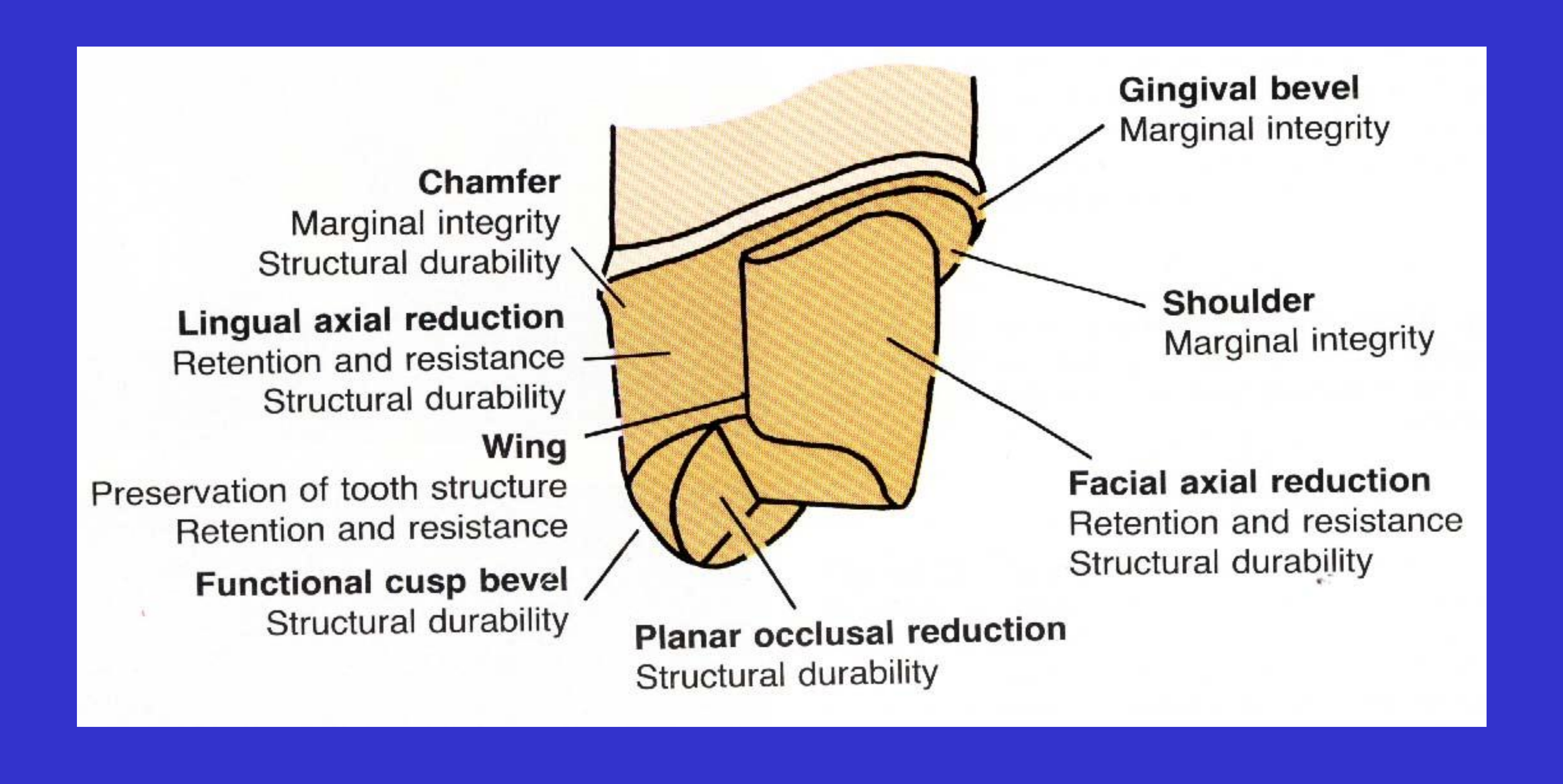
IMPROVED ESTHETICS

ALL CERAMIC LABIAL MARGIN

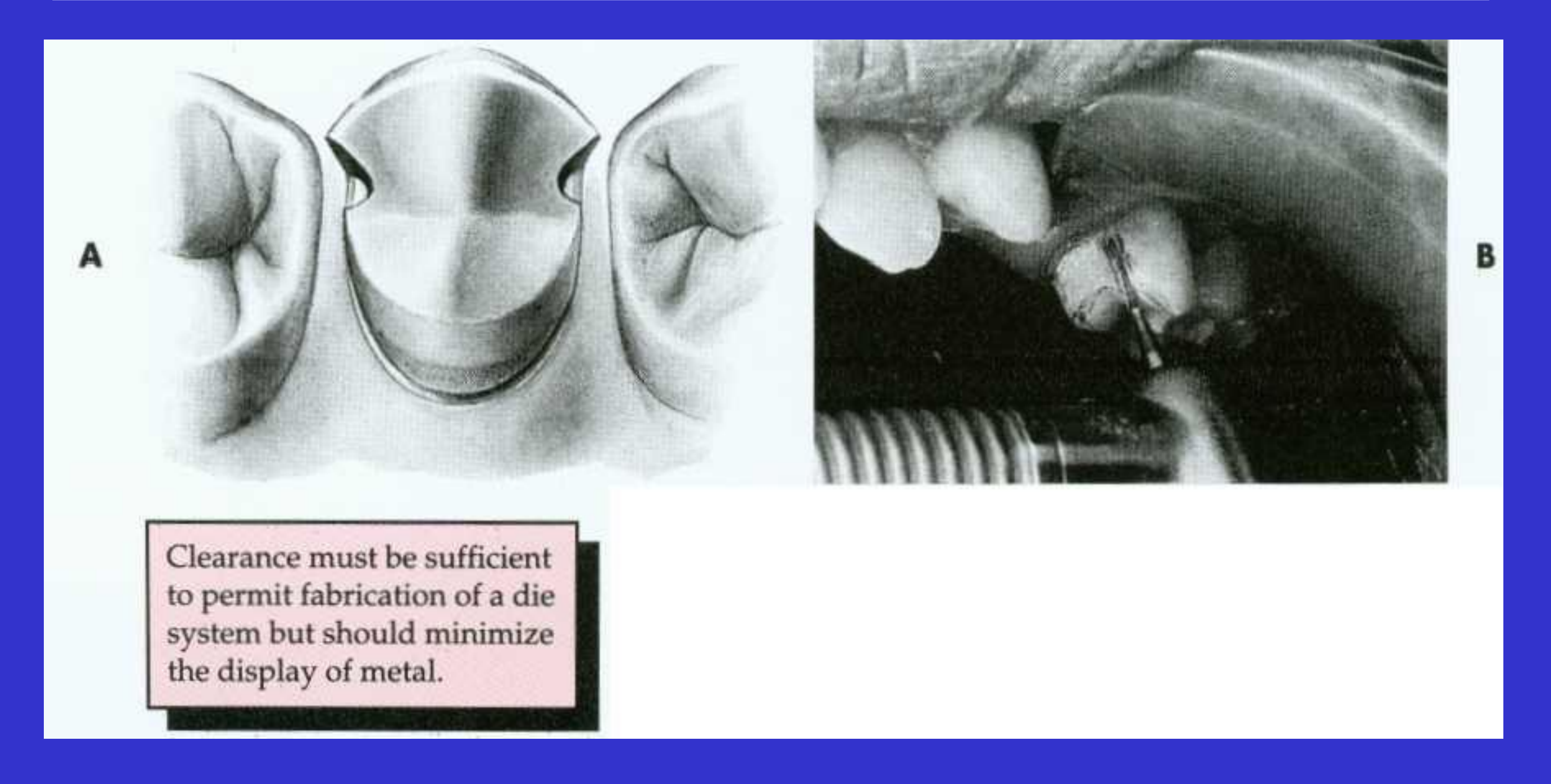
THIS ELIMINATES THE METAL COLLAR AT THE FACIOGINGIVAL MARGIN OF THE FINISHED METAL-CERAMIC RESTORATION



POSTERIOR METAL-CERAMIC CROWN

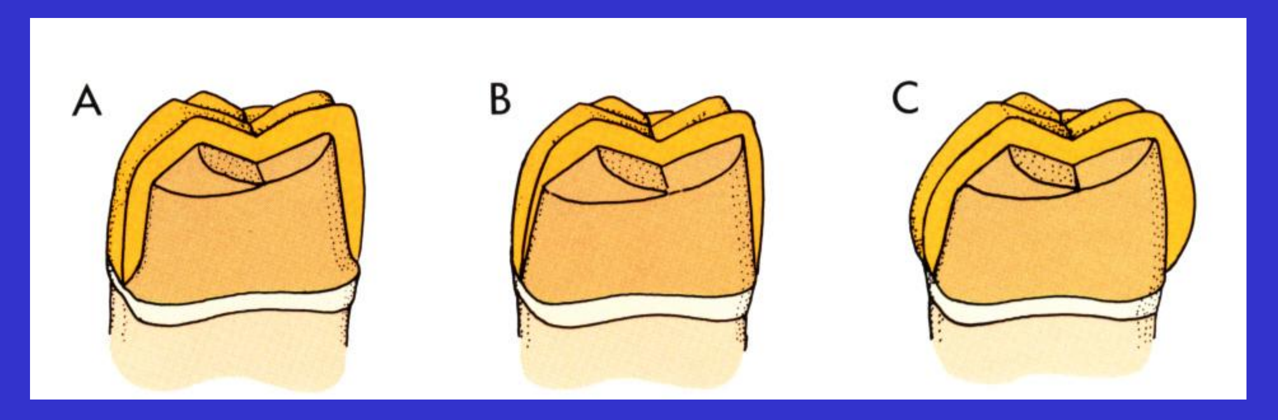


PARTIAL-COVERAGE RESTORATIONS



A, Correct placement of the mesial margin of a partial-coverage restoration is essential to good esthetics. To allow proper access for finishing, the restoration must extend just beyond the contact area, but the metal must remain hidden from the casual observer. B, The tooth should be prepared in its long axis; otherwise, metal will be displayed

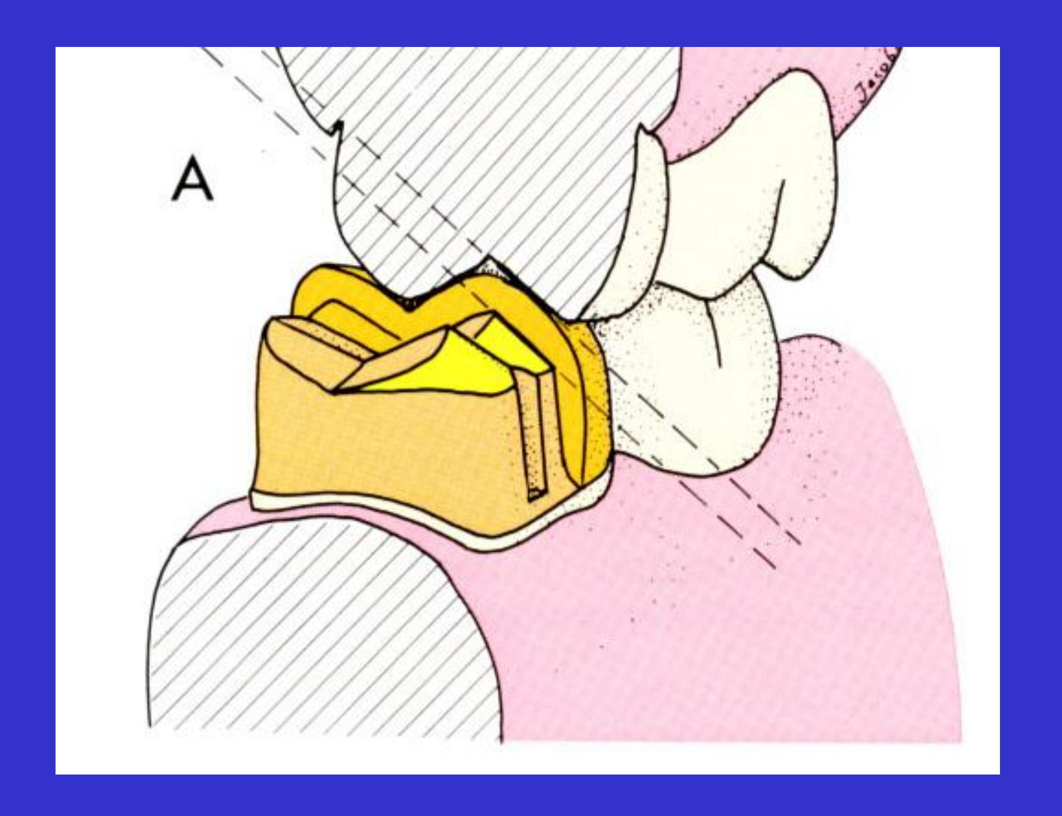
STRUCTURAL DURABILITY



- Restoration must contain bulk of material that is adequate to withstand the forces of occlusion.
- This bulk must be confined to the space created by the tooth preparation.
- Only this way the occlusion will be harmonious and axial contours normal.

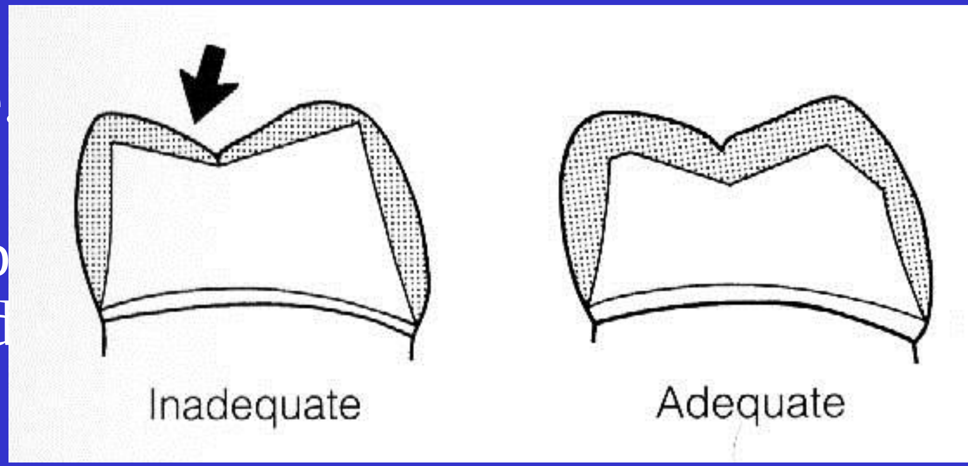
STRUCTURAL DURABILITY

1. Occlusal reduction.
2. Functional cusp bevel.
3. Axial reduction.



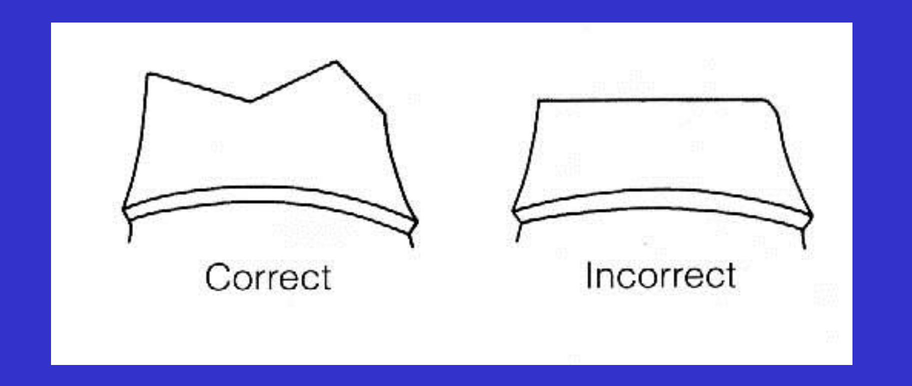
STRUCTURAL DURABILITY

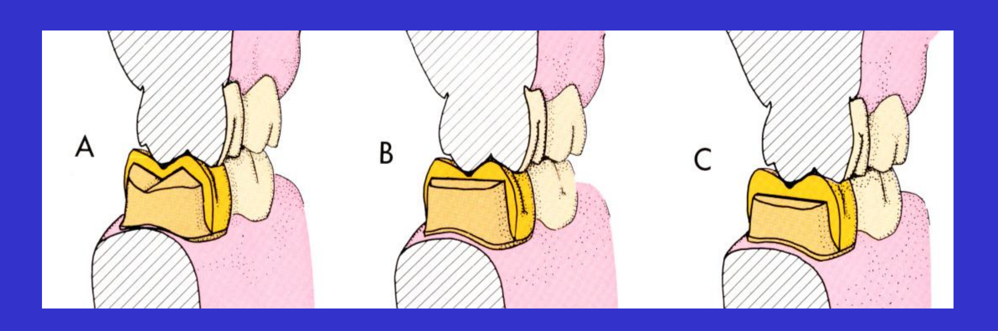
- Occlusal reduction : One of the most important features for providing adequate bulk of metal and strength to the restoration is occlusal clearance.
- For gold alloys- 1.5 mm clearance on the functional cusp (lingual of maxillary molars and premolars and buccal of mandibular molars and premolars).
- 1mm clearance on the nonfunctional cusp.



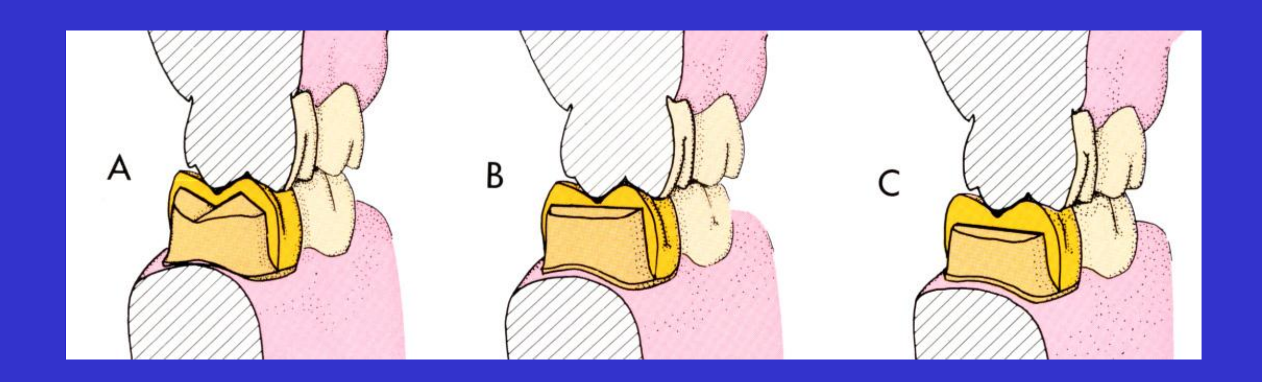
Occlusal Reduction

- The basic inclined plane pattern of the occlusal surface duplicated to produce adequate clearance without over shortening the preparation.
- A flat occlusal surface may over shorten the preparation.





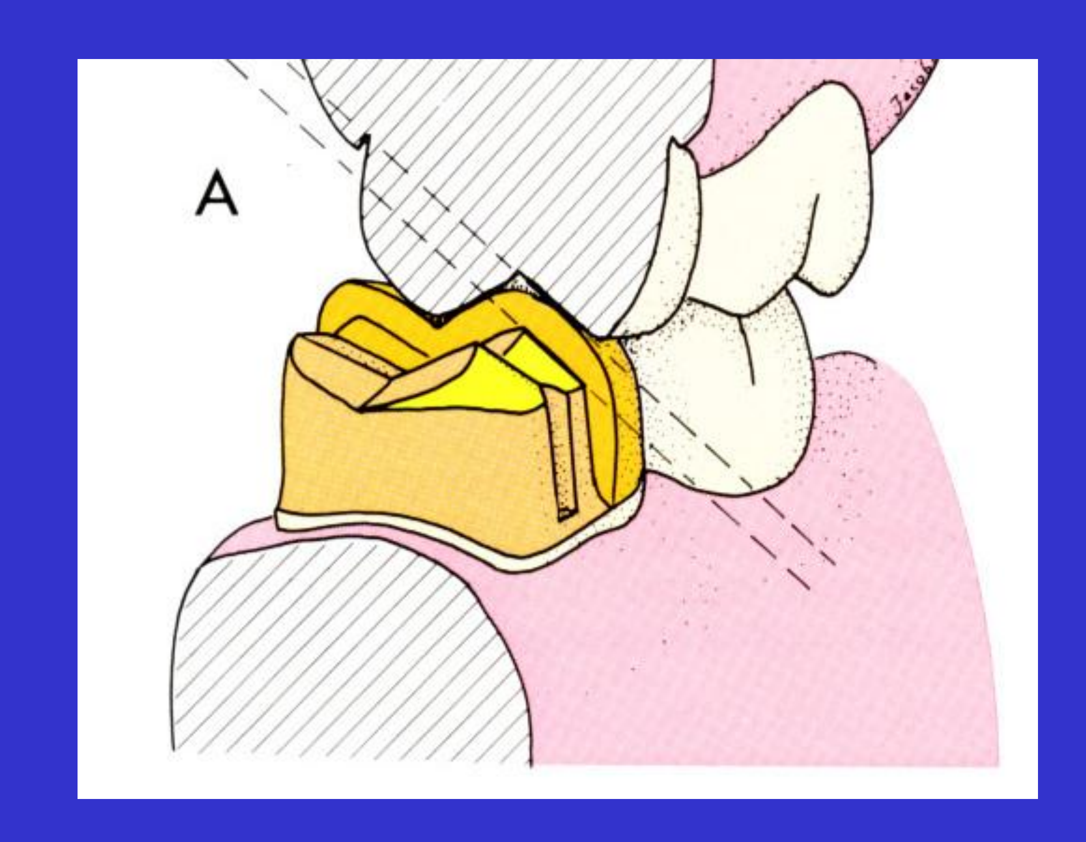
Inadequate Occlusal Reduction



- Makes the restoration weaker.
- will not provide adequate space to allow good functional morphology under the anatomical grooves.
- The restoration easily perforated by finishing procedures or by wear in the mouth.

FUNCTIONAL CUSP BEVEL

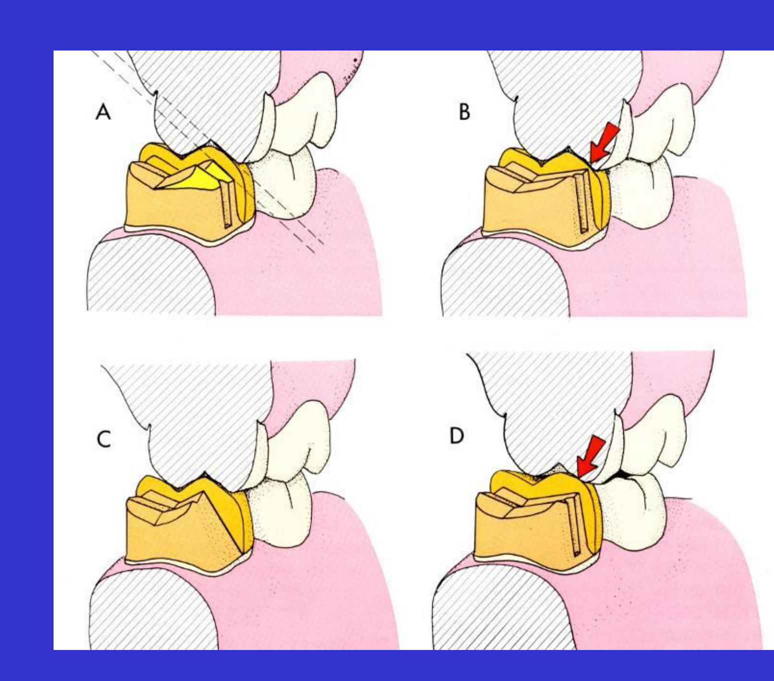
- An integral part of occlusal reduction is the functional cusp bevel.
- A wide bevel placed on the functional cusp provides space for an adequate bulk of metal in an area of heavy occlusal contact.



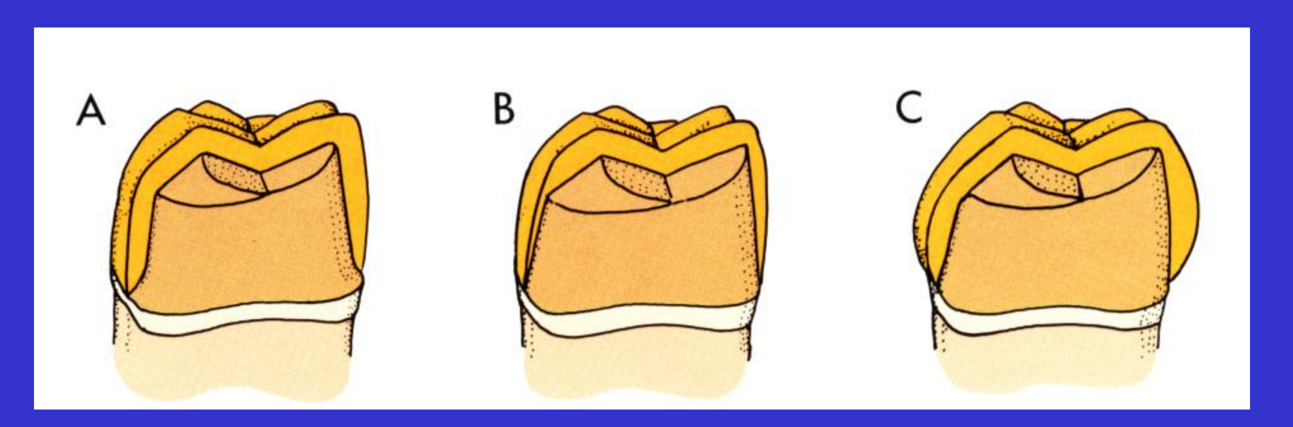
Functional Cusp Bevel

Lack of functional cusp bevel may produce several problems :

1. Can cause a thin area or perforation.
2. May result in over contouring and poor occlusion
3. Over inclination of the buccal surface will destroy excessive tooth structure reducing retention.



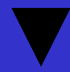
AXIAL REDUCTION



- Plays an important role in securing space for an adequate thickness of the restorative material.
- Inadequate axial reduction will have thin walls subject to distortion or result in over contouring the axial surface which could lead to periodontal problems.

Restoration Problems in Fixed

Can be avoided by



Correct Tooth Preparation

What is a Correct Tooth Preparation?



- Removal of tooth structure does not weaken the tooth
- Amount of reduction follows the requirements of restoration
- Resist displacement in all directions
- Presence of optimum tooth height
- Finish line that can accommodate robust margin with close adaptation
- Provide optimal space for crown which is sufficiently thick to prevent fracture, distortion or perforation



- Unnecessary reduction
- Endangers the pulp
- Lack of retention and resistance features
- Finish line that cause micro leakage
- Inadequate space for crown which is thin and may cause fracture, distortion or perforation

Incorrect
Tooth Preparation